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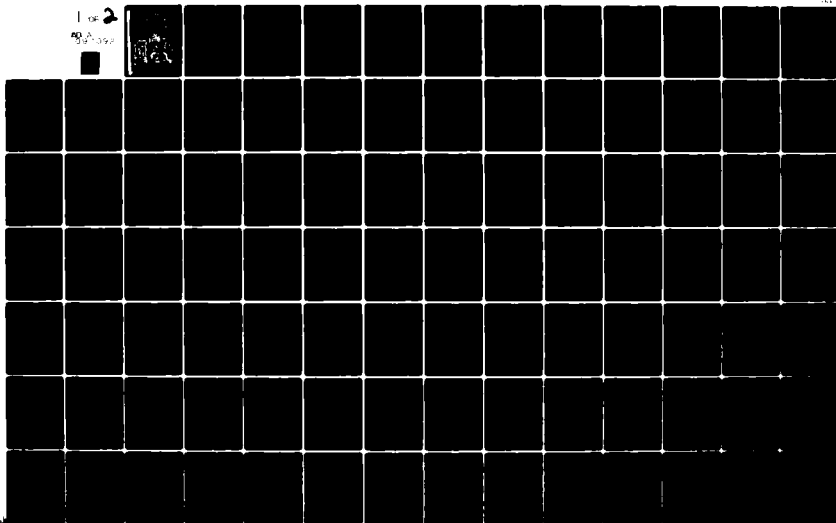
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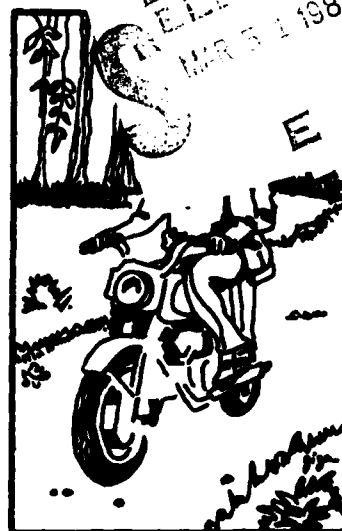
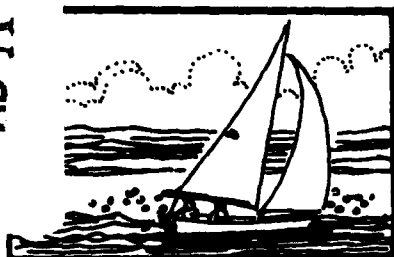
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LAND REQUIREMENTS

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Tennessee Colony Lake



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DEPARTMENT of RECREATION and PARKS

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20. importance of recreation will increase and there will be shifting of the use of some resources. These changes will add to or modify present use of resources. There are several potential geological hazards with the creation of the reservoir, but these can be overcome under the guidance of the appropriate state and federal agencies.

Land Requirements (Public Use) Plan
for
Tennessee Colony Lake, Trinity River Texas

Frank W. Suggitt
Project Director

Department of Recreation and Parks
Texas A&M University
College Station, Texas

prepared for

US Army Corps of Engineers
Fort Worth, Texas
30 March, 1972

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Inasmuch as this is a contractual study financed by the Corps of Engineers of the U.S. Army, credit is herewith given to that organization and especially to Mr. L.E. Horsman, Chief of the Environmental Resources Section. Particular help was received from Mr. Sam Garrett of that office, along with other members of the staff.

Appreciation is extended to Texas A&M University, the Texas Agricultural Experiment Station, and notably to Dr. Leslie M. Reid, head of the Recreation and Parks Department. These units of the University provided the encouragement and support services necessary to conduct the work.

The team of mature graduate students (see accompanying list of participants) who actually performed the work must receive the highest of plaudits. Although modestly reimbursed for their efforts and notwithstanding the educational and experiential benefits, they performed far above and beyond the call of duty. This task team project typifies this department's desire to help worthy students gain experience and sorely needed financial augmentation while working on practical projects.

My personal thanks are herewith extended to the Corps of Engineers, Texas A&M University, and to the task team of graduate students. It is a privilege and a pleasure to be associated with such a fine triumvirate.

Frank W. Suggitt, Professor
Recreation and Parks Department
April 15, 1972

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PARTICIPANTS

This study and report preparation were performed under the supervision of Dr. Frank W. Suggitt, Professor of Recreation and Parks, Texas A&M University. Mr. Glenn Kreag functioned as project leader and is to be commended for his outstanding efforts and dedication.

Members of the project team and responsibilities include:

Glenn Kreag - project leader

Michael Heit - visitation - systems approach

Philip Lavelly - mapping coordinator - background

Phillip McKnelly - mapping - environmental quality

Charles Burchell - mapping - socio economic
characteristics

Others who participated in early stages of the project include Mr. Tom Davis, now a member of the faculty of Colorado State University and Mr. Adolph Anderson, now with the Corps of Engineers in Fort Worth. In addition, numerous other members of the Texas A&M Recreation and Parks cadre of graduate students and faculty have critiqued various phases of the study.

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I. Introduction

Authorization

Tennessee Colony Reservoir was authorized by Section 112, Rivers and Harbors Act approved July 3, 1958. This report is authorized by Fort Worth District Corps of Engineers Contract No. DACW63-72-C-0010 dated 8 November 1971.

Purpose

Tennessee Colony is part of a comprehensive plan for a navigation channel, flood control, water quality control, water supply and recreation on the Trinity River and tributaries. The purpose of this report is to determine public use land requirements and recommend the location of public use sites.

Scope

Public use and the enhancement and preservation of the environment.

Background

Previous studies and reports

1. Trinity River and Tributaries, Texas, House Document No. 276, 89th Congress 1st session 1965.
2. Site Selection and Project Formulation, Tennessee Colony Lake Design Memorandum No. TC-2, US Army Engineer District, Ft. Worth, Texas 1971.

Basic Assumptions

1. No major changes in population growth patterns and trends will occur.
2. Recreation will continue to grow in importance and demand will show a steady growth pattern.
3. There will be no major change in the type of recreation needs and demands of the public. Minor changes will occur, shifting the use of some resources, but these changes will only modify or add to the present use.

II. Description of Project Area

Geographic boundary and physiographic classification

The Trinity River meanders south-southeast through Freestone, Anderson, Navarro and Henderson counties. The area is flat to slightly rolling with tributaries approaching the Trinity perpendicularly. These tributaries will give the lake a good indented shoreline, especially on the west side. The low flat land adjacent to the river is subject to flooding. Forty percent of it is in forest with the rest used for pasture and cropland. Gas fields are scattered over the four county area with five fields being partially in the flood pool.

The dam is located on the Trinity River approximately 3 miles north of Tennessee Colony in Freestone and Anderson Counties, Texas. Tennessee Colony Lake will extend about 29 miles northwest from the dam at normal conservation pool level (275') and hold 97,960 surface acres of water. At flood level (292') the lake will extend an additional 12 miles northwest and cover 147,000 surface acres. At conservation pool and flood stage the lake will cover parts of Freestone, Anderson, Navarro and Henderson counties. (See regional proximity map)

Climate

The reservoir area has a climate of mild winters and hot summers, mean annual temperature is 66°F. Rainfall is usually about 40 inches. The average warm season is 260 days. Winds normally are from the SE with "northers" causing the main climatic changes in the winter.

Topography, geology, soils and land use

The proposed Tennessee Colony Reservoir lies in the Coastal Plain Physiographic Province which is a gently undulating plain bordering the Gulf of Mexico. Strata underlying the plain dip to the southeast at a slightly steeper angle than the present land surface. This results in a series of outcrop belts essentially parallel to the present coastline. Differential erosion of alternating resistant and less resistant rocks in this tilted sequence has produced a series of low, landward facing escarpments which break the gentle seaward slope of the land and provide many panoramic vistas of the river and its flood plains.

The petrography of the geological formations around the conservation pool fall into the Quaternary Period and include three general soil classifications:

Alluvium	Flood plain deposits of clay, silt, sand, and minor gravel, with local peat deposits in bogs.
Quartz Arenite	Quartz sand: gray, weathers light gray. Loosely consolidated. Medium grained.
Fluviatile Terrace Deposits	Gravel, sand, and silt: in three terraces of the Trinity River and tributaries; 15 to 75 feet above the present flood plain level.

NOTE: All but just a small percentage of the alluvium soil type area will be inundated.

Study has indicated that there are several potential geologic hazards associated with the creation of the reservoir, but it is felt that these can be overcome if a sincere effort is made to do so under the strong guidance of the appropriate state and federal agencies.

Some of the possible problem areas as relating to recreation are as follows:

- (1) Seepage and ponding in the area of Catfish Creek east of the reservoir may present a problem. Whether or not these processes will occur depends upon the porosity and permeability of the Reklaw Formation. Its rock mechanical characteristics must be determined before definite conclusions can be drawn.
- (2) The possibility of the formation of swampy conditions exists in the Trinidad area and under the city itself and must be considered.
- (3) Potential peat deposit areas in the flood plain of the Trinity River will be inundated by the reservoir. Peat could effectively be utilized as soil conditioner to help build-up the soil in parks and other recreational areas; however, whether a peat recovery would be feasible or not remains open.

The land use of the area is predominately farmland, ranges and forests.

Biologic and ecologic features and resources

The Tennessee Colony Reservoir is associated with the Post Oak Savannah, Blackland Prairie and Pineywoods vegetational areas. Ninety-four species of woody plants are generally representative of east Texas vegetation. Only one specie, the hawthorn, Crataegus warneri, was endemic to Texas. The fall herbaceous flora was char-

acterized by the presence of five species endemic to Texas and nine others which were listed as rare. Spring and summer floras contained additional endemic and rare species including the grass-pink orchid which is listed only in Henderson County.

Several noteworthy ecological areas were cited in a recent study:

1. The uniqueness of the Engeling Wildlife Habitat Management Area lies in the habitat diversity. Springs, marshes, swamps and bottomlands associated with Catfish Creek displayed a great variety of plant life.
2. The Sand Lake area located at the confluence of Catfish and Beaver Creeks exhibited woody plants generally characteristic of east Texas. The shallowness of this lake, however, resulted in an interesting herbaceous flora....
3. The almost certain presence of the state champion green ash tree and the possible occurrence of state champion trees of pecan and Hercules-club contributed to the significance of the Indian and Rush Creek areas.
4. Upper Richland Creek was characterized by the presence of some fairly large trees.
5. The forested area along the Trinity River in the vicinity of Horseshoe Bend and Twin Lakes between Highways 85 and 31 was significant as a result of its large size.
6. Some high bluffs along the Trinity River near the northern boundary of the Coffield Unit of the Texas Department of Corrections were characterized by a diverse flora including loblolly and shortleaf pine.

Among the recommendations of the study that might have recreational value were the following:

1. If possible, the large trees located on Indian and Rush Creeks should be preserved.
2. Floating and floating-leaved anchored vascular plants should be closely monitored if the reservoir is constructed. These plants, as a result of shading and other factors, can lower oxygen levels and can cause the elimination of submerged green plants.

Fauna

Among the conclusions presented in a recent study on zoological elements as pertaining to recreation were the following:

1. A potential fishery will exist due to an enlarged habitat and the short plankton-to-fish food web common in reservoirs. However, oxygen, toxicity, and turbidity levels are presently critical in the Trinity River at the Tennessee Colony site, and would probably restrict a healthy warm water fishery in the upper end of the proposed reservoir.
2. Ten fish species may be eliminated from the site, 15 will probably be restricted to waters above or below the reservoir, 15 should benefit from the impoundment and 21 additional species will probably increase in numbers if rooted vegetation along the reservoir margins becomes established.
3. Twelve amphibian species and 16 species of reptiles will be forced to emigrate from the bottomland forested areas upon filling of the Tennessee Colony Reservoir. Five reptile species will be restricted to flowing water habitats near the reservoir, while 2 amphibian and 17 reptilian species may benefit by increased marginal areas formed by the reservoir.
4. A highly diversified bird and mammal fauna presently exists in the Tennessee Colony area, although there are no endemic or unique species. Beavers occur here in higher densities than perhaps anywhere else in Texas.
5. Deer, squirrel, and waterfowl are extensively hunted, and to a lesser degree numerous other game species. Most of these populations, particularly deer, will be reduced as a result of habitat destruction.
6. There are several important nesting sites of herons and egrets, the largest of which is at Sand Lake.
7. Rare or endangered species known to occur in small numbers during the non-breeding season are the Bald Eagle, Osprey, and Peregrine Falcon. These species are not likely to decline as a result of the proposed project, and in fact their populations may be slightly favored.
8. Destruction of bottomland hardwood forests will cause a decline in many mammals and in a large number of breeding and non-breeding species of birds. On the other hand, winter populations of waterfowl, migratory shorebirds, and certain other aquatic birds may increase. The loss of forest populations, however, will be greater and of more significance than the gain in aquatic popu-

lations, so that the net effect of the proposed reservoir on the avian and mammalian faunas will be detrimental.

9. Bird and mammal populations downstream from the proposed reservoir are likely to be adversely affected by the elimination of the periodic inundation of the floodplain, which will result in the drying up of marshes and sloughs, and perhaps eventual elimination of some of the wet-adapted forests.

10. Pesticide concentrations, oil pollution, siltation, and choking by water weeds are some of the wildlife hazards which will need to be guarded against in the new reservoir.

11. Barge traffic along the reservoir will greatly reduce the potential of the reservoir as a suitable environment for waterfowl and other wildlife.

Recommendations

1. Pollution abatement in the Dallas-Ft. Worth area should be concluded before impoundment of the Tennessee Colony site because of the adverse conditions now imposed on aquatic life.

2. Preimpoundment surveys of fishes in the Trinity River and its tributaries should be conducted to identify potential fishery management problems.

3. The Tennessee Colony Reservoir should be closely monitored for:

- (a) pesticide, chemical, sewage, and oil pollution
- (b) silting
- (c) choking by aquatic weeds

4. The Gus Engeling Wildlife Management Area and the Sand Lake area on Beaver and Catfish creeks should not be inundated.

5. The river below the dam should have provisions along its course for diverting water periodically into existing marshes, sloughs, oxbows, and swamps.

6. Bottomland hardwood forests remaining along the shores of the reservoir should be set aside for complete protection of the flora and fauna.

Accessibility

Excellent highway connections exist between the proposed lake and population centers. Dallas lies 64 miles and Fort Worth 92 miles northwest of the project via Interstate 45 and U.S. highway 287. Waco is 76 miles southwest via highway 31 and Tyler is 47 miles east via Texas highway 31. Excellent access is provided from the north and south by interstate 45 which runs about 20 to 30 miles west and parallel to the long axis of the lake. Additional access is provided by Texas highway 19 from the north and south, Texas highway 31 from east and southwest, U.S. highway 287 from the northwest and southeast (which will cross the reservoir at its center with a causeway) and U.S. highway 79 from the southwest and northeast. There are presently 90 points where existing roads touch the edge of the proposed lake. The Recreational Demand Study indicates a need for widening and improving roads in the immediate vicinity to meet higher traffic volume.

Environmental, recreational and cultural conditions, assets and attractions

The area's human landscape exhibits large cattle and cotton holdings with small agricultural service towns. Many of the smaller communities have lost this servicing function due to increased mobility of their clientele and the population shifts from rural and small town to large urban areas. Manufacturing is scarce in the area, but a chemical plant and two power plants are located near the proposed shoreline. The power plants both radiate a number of high voltage power lines which detract from the appearance of the reservoir in the places where they cross or run along the shoreline. The effect of the chemical plant is undetermined as it is unknown what chemical effluent it may discharge or if any smoke or fumes are released into the atmosphere.

Thus, human activity can be described as low key and primarily agricultural, population being sparse with a minimum urban concentration.

Hydraulic and hydrology and limnological considerations (wind, siltation, turbidity, groundwater, etc.).

Scenic-historic-archeological-scientific features

There are a few natural, man-made features or historical sites of national significance in this area. One area of nominal importance includes Sand Lake and Catfish Slough which are important ecological areas. A nine hundred acre area along Catfish Creek is a summer nesting place for thousands of egrets, herons, ibis and other water birds. Whooping cranes (an endangered species) have been known to stop over here on their way to and from Aransas National Wildlife Refuge and in the winter the site is a popular haunt for ducks.

This area in addition to the Gus Engeling Wildlife Management area, a 11,941 acre area located a few miles northeast of the proposed dam site, provides a unique attraction for nature enterpretation programs, hiking trails, and sightseeing for birdwatchers, tourists and day-users.

Because Dallas and Fort Worth lie at the headwaters of the Trinity River and Houston at its mouth, the Trinity has for some time offered a great potential for water transportation. Several ports that were created on the river in this area during the latter half of the 19th Century and which hold special significance as historic landmarks today will not be inundated. These ports are as follows: Cox's Bluff located two miles south of Cayuga, Lindsey's Bluff located just a few hundred yards north of Cox's Bluff, and Wildcat Ferry (one of the most popular ferries on the river) located three or four miles north of Cayuga. Two highways, the old Fosterville Road from the east and the Frontier Road from the southeast, joined at Wildcat Ferry.

For many years the Trinity served somewhat as a boundary between war-inclined Indians of Central and West Texas and the more peaceful East Texas Indians. Many Indian camps, permanent and temporary, have been located in the area by archeologists. Some of these camps that will not be inundated are found at the following sites: (1) on a ridge about one hundred yards east of Cox's Bluff, (2) near the river bridge on Highway 31 and on the left river bank there is evidence of an Indian Cemetery and permanent camp site, and on Rifle Ridge in Navarro County.

Many of the artifacts uncovered by archeologists and the history of this region should be displayed and communicated in an interpretive center and the above sites designated as historical landmarks.

Though the area is influenced by the Post Oak Savannah, Blackland Prairie and Pineywoods vegetational areas, it has very little unusual or majestic plant life. There may be present, however, a state champion green ash tree and possible champion trees of pecan and Hercules-club on a peninsula on Indian Creek which are unique and worth preserving for recreational and scientific purposes.

The area is blessed with a number of bluffs and ridges which will afford the viewer a magnificent panoramic view of the water surface and opposite shoreline. Two of these are Green's Bluff located west of Yard, and Rifle Ridge near Daniel Lake in Navarro County.

Water quality (present and anticipated future, nutrient loadings, and biological factors).

Several factors, if not corrected, may have an adverse affect on water quality and recreation use. One of these problems is the potential pollution by oil field brines and oil which are commonly retained by present practice in unlined pools or are discharged onto the ground and into creeks. The contamination of the lake water by brines results in a considerable increase in the water salinity. Potential oil and oil-field brine pollution can be avoided through careful production, storage, transport and disposal practices in compliance with state and federal regulations. The practice of pumping waste disposal into deep disposal wells must definitely be the rule.

Density stratification in the lake water is possible. The denser saline water forming the lower water layer in the basin can cause anaerobic, toxic conditions.

Salinity also causes an increase in flocculation and sedimentation of clay minerals.

The overall result is a decrease in water quality which makes water purification for drinking water production more costly, and a rapid rate of silting-up of the reservoir. Flushing of the basin to remedy this situation would produce many adverse affects downstream including large fish kills.

The discharge of sediments by the tributaries into the shallow-water subbasins will cause their progressive silting-up which is also promoted by the possible increased salinity and clay flocculation of the lake water. Water quality is in either way decreased.

The strip-mining of lignite north of Fairfield County for fuel to generate electric power by the new Big Brown Steam Electric Station northeast of Fairfield poses a possible pollution problem. These lignites contain sulfur and possibly mercury compounds. Apparently, sulfur dioxide gas will not be removed from the stack emissions which would also apply to possible mercury vapor. This results in a considerable sulfur dioxide and mercury concentration in the emissions. Dispersal by winds has adverse effects in the downwind areas including pasture land, the reservoir, and its drainage area. An increase in the acidity of surface waters in the neighborhood of the strip-mined area is possible.

Study has shown (1) that the Trinity River has reached a high degree of eutrophication because of the excessive populations of phytoplankton and periphyton; (2) that it had a high sampled value for total coliform bacteria which suggested that sewage effluent was the primary source of organic pollution; (3) that the diversity index values indicated a moderately polluted environment with heavy pollution periodically indicated near the NIPAC, Inc. outfall; (4) that the removal of streamside vegetation in channelization will probably increase the standing crop of algae, increase water temperature, reduce the oxygen saturation values, increase bank erosion and perhaps increase turbidity; (5) that the upper portion of the proposed reservoir should be the most critical region from a eutrophication standpoint, because of increased water transparency and high nutrient levels, and (6) that eutrophic conditions should be reduced below the proposed reservoir by nutrient and silt removal in the impoundment. It was also reported that pesticide levels were low in the river but that insecticide and herbicide usage for the counties in the Tennessee Colony area was high. (For additional information, see also Section VIII, Special Problems).

III. Project Data

Elevation and surface area in acres

	Elevation	Surface acres
1. minimum pool		
2. normal recreation (conservation) pool	275 feet	97,960 acres
3. flood control pool	292 feet	147,000 acres
4. flood control plus surcharge		

Morphometric data of normal recreation pool

- | | |
|---|------------|
| 1. mean depth-lower lake | 35 feet |
| upper lake | 20-25 feet |
| 2. mean breadth | 6 miles |
| 3. length | 29 miles |
| 4. shoreline length | 326 miles |
| 5. average end-of-month
elevation and area | |
| 6. exceedence frequency | |

Lake Elevation	exceedence freq. Events/100 years
280	22
285	10
290	4
292	2

7. Drawdown during recreation
 season

IV. Recreation Market Area

Zone of expected origin of 80 percent day users

An irregular area with a boundary approximately 100 miles from the reservoir was determined to be the approximate area of 80% day use. (See map below) Within this area, all counties whose centroid is within 75 miles of the reservoir are included in the projection as being in the market area. Counties which are between 75-100 miles from the reservoir were examined individually to determine whether their populations would utilize the reservoir or be more likely attracted by other intervening recreation opportunities. No counties beyond 100 miles were included in the market area because of the number of intervening water resource opportunities existing. Large reservoirs, like Tennessee Colony often draw from areas larger than 100 miles, but in this case, it was felt that intervening opportunities would limit the area to a maximum of 100 miles from the project.

Socio-economic characteristics of the market area population

Existing population characteristics

The existing population of the Tennessee Colony Reservoir market area is a mix of urban and rural populations. The immediate vicinity of the reservoir is rural with small towns scattered throughout the market area. Day users will be predominately from the large urban areas of Dallas, Fort Worth, and Waco, and smaller nearby urban centers such as Palestine, Malakoff, Corsicana, and Athens.

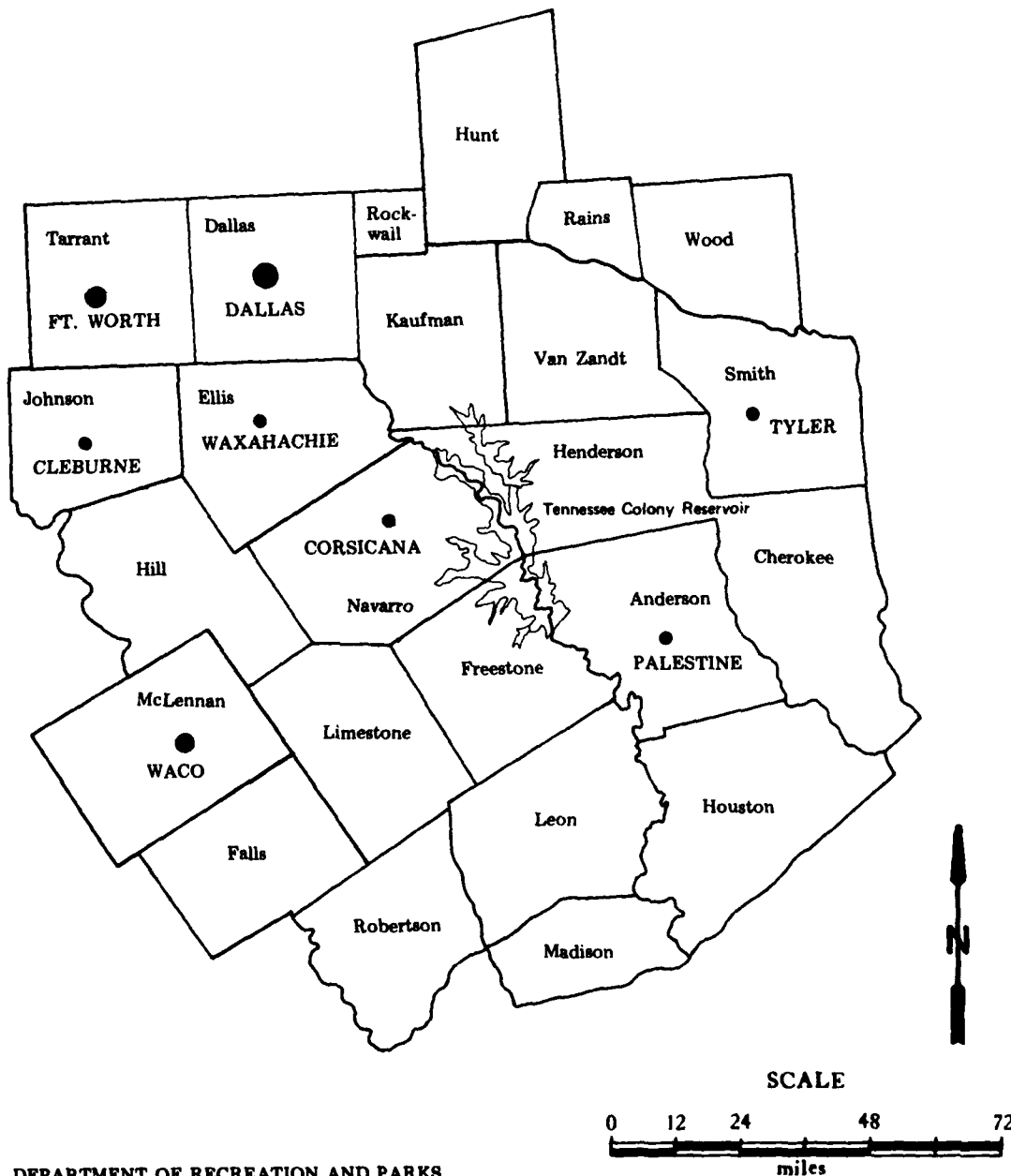
Project visitation will be mostly influenced by the population patterns and preferences of the Dallas-Fort Worth area.

Projected population growth, distribution and growth patterns

Population growth for the market area will be quite extreme. The present population is distributed on an outer fringe of the reservoir market area in Dallas, Fort Worth, and Waco. This distribution pattern will be maintained in the future with a steady population increase predicted. The major population pattern change will take place around the immediate vicinity of the reservoir. The reservoir will receive an influx of population for residency especially around the northern half.

Evidence of this influx exists at the adjacent, Cedar Creek Reservoir which has experienced an extreme population growth rate since its completion. At present, there are large numbers of residential developments occurring around this reservoir. Most of these residences are being purchased by Dallas area residents. There is a steady demand for second homes, retirement homes for Dallas residents, and even primary residences from which people may commute to the

DAY-USE MARKET AREA



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Dallas area. This demand will be multiplied with the completion of the Tennessee Colony Reservoir.

This influx of residential population is not properly reflected in the population projections. By 1985-1990, a sizeable population will exist on Cedar Creek Reservoir which will significantly increase the projected day use.* Additionally, within 10-15 years after the completion of the Tennessee Colony Reservoir, a similar residential population will form around it further compounding day use. This increased population is not reflected in the population projections of the four counties surrounding the reservoir. In fact, current Office of Business Economic Research Service (OBERS) Series C projections show a decreasing population for these counties.

Changes in leisure time, mobility and income

Although it is anticipated that there will be a continued gradual decline in the average workweek, leisure time will be most significantly changed by the recent trend to shift to a 4-day work week and later to a possible 3-day workweek. With a larger block of leisure time available each week, it is expected that an increased recreation participation will occur and travel to recreation areas beyond participants' immediate vicinity should increase significantly.

Current highways make accessibility to the reservoir excellent. There are two major highways leading from the large areas of Fort Worth-Dallas, U.S. highway 175 and Interstate 45. Interstate 20 north of the reservoir will be a major peripheral feeder artery. Not only these major arteries are a factor but several state highways, farm roads, and county roads are in excellent condition. They will make most areas of the lake easily accessible.

In the future, public transportation should become increasingly important in influencing mass mobility. Metropolitan and long distance rapid transit systems will provide reliable, low cost transportation. This will particularly influence lower economic groups to seek recreation opportunities away from their local neighborhoods and outside the cities. The interstate (I-45) corridor between Dallas and Houston is a likely location for a rapid transit facility. With a connection at Corsicana, public transportation could be provided to Tennessee Colony Reservoir. With rapid transportation becoming increasingly popular, the possibility of public transportation to Tennessee Colony Reservoir within its first 10 years of operations is very good.

* Telephone Company's projections predict 80,000 people on Cedar Creek Lake by 1985.

As opposed to leisure time and mobility, no significant changes are forecast for personal income. Basically, incomes are expected to rise slowly while inflation also increases making the incremental real gain in earnings very small. The greatest gains can be expected by the nation's poor and retired as social welfare programs grow.

Interstate demand

Interstate day use demand will be negligible. The reservoir is located too far from adjacent states to expect day use from other states. There may be substantial camping and transient visitation since two interstate highways pass relatively near the reservoir and it is a short drive to Dallas from the reservoir. The reservoir is also a logical stopover point for visitors entering Texas from the northeast and who are traveling to southeast Texas, south Texas and Mexico, the Hill country, and west Texas. The new Dallas-Fort Worth Regional Airport will enhance long distance visitation and open up a new global visitation market potential.

Alternative water-oriented recreation resources in the market area

supply and demand:

At the present time in the metropolitan area of Dallas and Fort Worth there are five large Corps reservoirs. In addition to the five Corps reservoirs there are thirteen reservoirs within a one hundred mile radius. (See Regional Proximity Map) Three of these are Corps reservoirs (Denison, Whitney and Navarro Mills), which lie on the outer extremes of the radius, and the other ten are river authority, city, or community lakes, some of which are quite small. The 1969 attendance figures for the 8 Corps reservoirs, which is some reflection of current demands in the 100 mile radius area around Dallas-Fort Worth, was 23,691,088. Of the Corps reservoirs in the Dallas Fort Worth area, Bardwell and Benbrook, are less than 4,000 surface acres and only the Garza-Little Elm Reservoir is over 20,000 surface acres. The two remaining large reservoirs in the area are Grapevine and Lavon having 7,000 and 11,000 surface acres respectively. Both are scheduled for enlargement. These lakes, although heavily used for recreation, were constructed with flood control as the primary purpose. For recreation purposes there are not enough access areas, picnic areas, swimming beaches, and almost no camping or rental services. The result of this type planning for such a major urban population has been a severe strain on the existing reservoir facilities to meet the recreation demand. With the severe crowding at present, and the increasing rate of demand there is not enough surface water to meet the present of future population's recreation needs. The predicted population growth makes it obvious that there is a need to develop greater numbers of reservoirs if the water recreation demand is to be met.

Recreation demands of the market area (covered in previous sections)

Project capability

Optimum visitation is a measure of project capability. It is based on many of the physical resource factors affecting the project, but must also consider population in the market area, access to the project, and user needs and preferences. Standards for maximum crowding on the project must then be determined to conform with optimum visitation criteria which have been established. For reservoirs, these standards are keyed to a maximum boat density desirable for the project. The following computations were used to obtain the optimum visitation for Tennessee Colony Reservoir.

Boating is determined by calculating the relative percentage of fisherment, water skiers, and pleasure boaters expected to use the lake on a normal summer weekend day. A comparison with similar reservoirs was used to establish expected percentages.*

TABLE 1
Participation in Boating Activities

		<u>Reservoir Attendance</u>			
<u>Year</u>	<u>Reservoir</u>	<u>Percent Fishing</u>	<u>Percent Water Skiing</u>	<u>Percent Pleasure Boating</u>	
1966	Denison	48 %	10 %	5 %	Total Boater Popu- lation
	Eufaula	36	9	1	
1967	Denison	42	10	8	
	Eufaula	33	14	11	
1968	Denison	54	7	7	
	Eufaula	26	6	7	
	Average	40 %	9.5%	6.5%	56%
Percent of Boater Population		71.5%	17.9%	11.5%	

It was decided that these percentages would be similar to that which is expected at Tennessee Colony Reservoir. This information was then applied to constant space requirements for these boating activities. A standard of 6.0 acres/boat was chosen as the overall space requirement needed to accommodate this mix of boating activity at the desired density standard.

* Data from surveys on Denison and Eufaula reservoirs were taken from Office, Chief of Engineers Department of the Army, Technical Report No. 2, Estimating Initial Reservoir Recreation Use, Washington, D.C., 1969.

Additional variables are as follows:

1. Persons per boat
 - Fishing: 2 persons per boat
 - Water skiing: 4 persons per boat
 - Pleasure boating: 4 persons per boat
2. Turnover rate = 2

Calculations

$97,960 \text{ water acres} \div 6.0 \text{ acres/boat} = 16,326 \text{ boats on the lake at one time}$
 $71.5\% \times 16,326 = 11,673 \times 2 \text{ persons/boat} = 23,346 \text{ persons fishing at one time}$
 $17.0\% \times 16,326 = 2775 \times 4 \text{ persons/boat} = 11,100 \text{ persons water skiing on the lake at one time}$
 $11.5\% \times 16,326 = 1887 \times 4 \text{ persons/boat} = 7,508 \text{ persons pleasure boating on the lake at one time}$
 $\text{Persons on lake at one time total} = 41,954$
 $41,954 \times 2 \text{ turnover rate} = 83,908 \text{ visitors on an average summer weekend day} \times 26 \text{ weekend days} = 2,181,608 \text{ summer weekend users} \div .61 \text{ summer weekend visitation rate} = 3,576,405 \text{ summer visitation} \div \text{by } .59 \text{ summer visitation rate} = 6,061,705 \text{ optimum annual water visitation.}$

In order to determine the total visitation, an estimate must be made of the number of visitors on land in addition to the number on water. The method used to determine land visitors is based on a comparison of similar reservoirs. A ratio is calculated of the number of land users compared to the number of water users based on participation in the various land and water activities. Activities were classified as follows:

<u>Water based activities</u>	<u>Land based activities</u>
Fishing	Camping
Pleasure boating	Picnicking
Water skiing	Swimming*
	Sightseeing
	Other

* Swimming was considered land based since the majority of a swimmer's time consists of beach activities which were not categorized separately in the corps survey.

TABLE 2
Water based activities

RESERVOIR	YEAR	FISHING	BOATING	SKIING	TOTAL
Denison	1966	48%	4%	10%	62%
Denison	1967	42%	8%	10%	60%
Denison	1968	54%	7%	7%	68%
Eufaula	1966	36%	5%	9%	50%
Eufaula	1967	33%	11%	14%	58%
Eufaula	1968	26%	7%	6%	39%
TOTAL					337%

TABLE 3
Land based activities

RESERVOIR	YEAR	PIC- NICK- ING	SWIM- MING	CAMP- ING	SIGHT- SEEING	OTHER	TOTAL
Denison	1966	6%	52%	18%	5%	2%	83%
Denison	1967	8%	44%	17%	8%	2%	79%
Denison	1968	4%	38%	18%	5%	3%	68%
Eufaula	1966	10%	55%	33%	18%	0%	116%
Eufaula	1967	8%	44%	44%	19%	1%	116%
Eufaula	1968	7%	32%	27%	25%	1%	92%
TOTAL							554%

SOURCE: Office, Chief of Engineers, Department of the Army, Technical Report No. 2, Estimating Initial Reservoir Recreation Use, Washington, D.C.

Average annual water based activity:

$$337\% \div 6 = 56.16\%$$

Average annual land based activity:

$$554\% \div 6 = 92.33\%$$

Land : Water Ratio

Average annual land based activity \div average annual water based activity = $92.33 \div 56.16 = 1.647$.

Land Use : Water Use Ratio = 1.65:1

The above ratio was considered low for use in determining optimum visitation at Tennessee Colony Reservoir. Current trends show an increasing interest in land activities as indicated in other sections of this report. Therefore the land use to water use visitation was increased to 1.85:1 to reflect this change in user preference. Total optimum visitation, based on this higher land use ratio is shown below.

Optimum annual land visitation = annual water visitation
 $6,061,705 \times 1.85 = 11,214,154$
 Optimum annual visitation = $6,061,705 + 11,214,154 = 17,275,859$

TABLE 4
Recreation Analysis

Design load computations Optimum Visitation

Project: Tennessee Colony

Total annual attendance: 17.3 million

Design day load

17.3 million total annual attendance x .59 visits during summer months

x .61 which occurs on weekends = 6,226,000 total number of weekend users

Total number of weekend users \div 26 weekend days = 240,000 design day load.

Picnicking

Design day load x .10 of total are picnickers = number of picnickers 24,000

No. of picnickers x .40 of picnickers requiring facilities = number of picnickers requiring facilities 9,600

No. of picnickers requiring facilities \div turnover rate of 2 \div 3 persons per vehicle = 1,600 picnic units required.

Camping

Design day load x .26 of total are campers = number of campers 62,400

No. of campers \div 3 persons per vehicle = 20,800 camping units required.

Beaches

Design day load x .50 swimmers = number of swimmers 120,000

No. of swimmers x .60 swimmers on beach = number of beach users 72,000

No. of beach users \div turnover rate of 3 = number of users on beach at any one time 24,000

No. of users on beach at same time x 50 square feet of beach per person = 28 acres of land area required for sand beach

No. of swimmers x .40 are swimmers in water = number of swimmers in water 48,000

No. of swimmers in water \div turnover rate of 3 = number of swimmers in the water at any one time 16,000

No. of swimmers in the water at any one time x 100 square feet of water surface per user = 37 acres water surface required.

10% of swimmers need no additional land.

Boat ramps

Design day load \div load factor of 3 = number of vehicles 80,000

No. of vehicles x .20 of vehicles with boats = number of boats
16,000

No. of boats \div 60 launchings per day = 267 boat launching ramps
required.

Space requirements for optimum visitation:

Picnicking 1,600 units \div 15 units/acre = 114 acres

Camping 20,800 units \div 7 units acre = 2971 acres

Beaches 28 acres

Subtotal 3113 acres

Roads, parking, unusable land, etc. 1038 acres

Aesthetics, open space, buffer,
environmental protection, etc. 1557 acres

TOTAL 5708 acres.

The importance of the project in meeting identified needs

There are millions of people using the current reservoirs and the facilities which are available in the market area. The problem of providing just water orientated recreation for the increasing demand can be met through providing access to almost any surface water which is developed. But not all individuals are interested in the same type of reservoir recreation experience. At present, the majority of visitors to reservoirs have a very limited range of activities in which they can participate. These areas are crowded with activities mostly for the young adults, and very little is provided for the older, less active, and the younger, less capable individuals visiting the resource for an outdoor experience. If a certain activity is available it is usually limited to the first few people to enter the park area. On the existing reservoirs in the market area, there are very few good swimming beaches, and week-end rental facilities are almost non-existent. Rental boats for visitor use number only a few dozen to accommodate visitation approaching 25 million annually. With the increased interest in trailer camping more spaces should be provided with the proper planning for sewage and other utilities. Because of present demands the green open spaces of older reservoirs have been over-run in an attempt by the participant to find the outdoors he is seeking when he visits a reservoir.

The Tennessee Colony project can fulfill many of the unmet needs and not only reduce overcrowding but provide a better variety of activities as well. Through early planning and foresight, green spaces can be preserved, areas set aside for such activities as resort complexes and golf courses, bicycle paths, nature trails, equestrian areas and other activities which will develop greater population interest in the future.

V. Outdoor Recreation Attendance

Per capita participation rate

The visitation estimate follows the procedures outlined in Office, Chief of Engineers, Department of the Army Technical Report No. 2, Estimating Initial Reservoir Recreation Use, dated October 1969.

Similar reservoirs were difficult to find due to the projected size of Tennessee Colony Lake. In order to minimize the chance of an erroneous attendance prediction based on a unique situation at one reservoir, four reservoirs, Denison, Eufaula, Clark Hill and Hartwell were selected and their data were pooled to derive a per capita use rate decay curve. (See figure 1). Then the resultant curve was determined by visually placing a line to the data and adjusting and reversing it to best fit the situation which describes the expected visitation rates at Tennessee Colony Lake.

Annual attendance

Using the population projection figures for Texas counties (OBERS, Series C) and by determination of the distance of each county centroid from the nearest access to the proposed Tennessee Colony Reservoir, projected day use visitation for each county was determined. (See table 5) The summation of this visitation is the estimated market area day use visitation of 80% of the total day use visitation. This market day use visitation and the total day use visitation are shown at the bottom of table 5. However, the future projected visitation totals only account for visitation at the current rates.

Therefore, in projecting day use, a multiplier was included to account for the increasing per capita use-rate over time. (See table 6 below) The resulting projected day use visitation for Tennessee Colony Reservoir is shown at the bottom of Table 5.

In addition to day use, the use-rate for campers and overnight visitors must be determined to derive total projected visitation. In accordance with Corps methodology, a comparison with data from two similar reservoirs* of the percentage of campers was made. From this, it was estimated the 16% of the total visitation would be campers. This percentage is considered conservative since many Corps reservoirs in Texas experience higher camping visitation. Overnight visitation

* Data for Denison and Eufala reservoirs were used. Data for Clark, Hill and Hartwell reservoirs which were used to determine the per capita use rate were incomplete and therefore not included in determining specific activity rates.

(Figure 1) ESTIMATED PER CAPITA USE RATE Tennessee Colony Reservoir

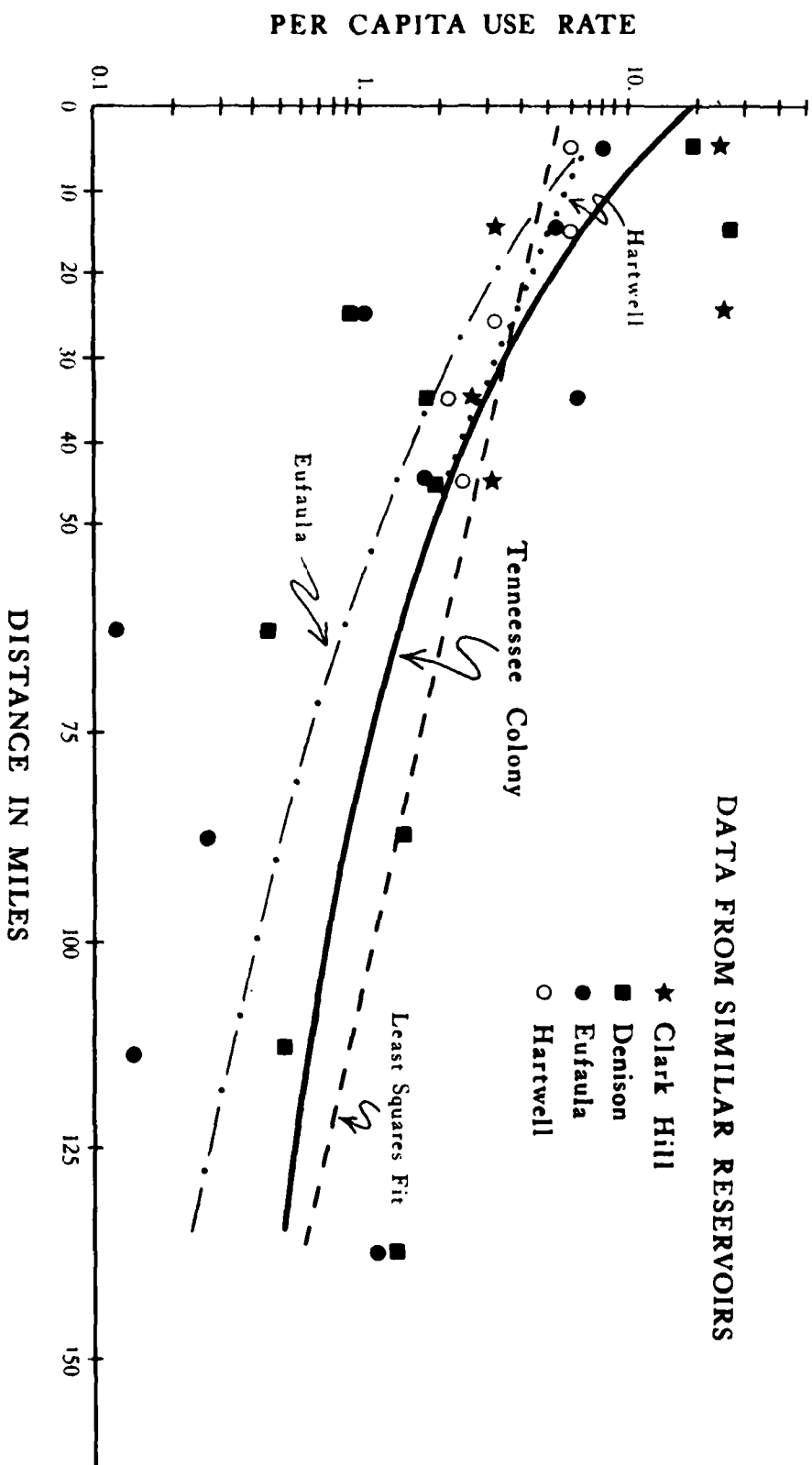


TABLE 5
TENNESSEE COLONY RESERVOIR
VISITATION PROJECTIONS BY COUNTIES

ZONE	COUNTY	ROAD MILES TO CENTROID	PER CAPITA USE RATE	POPULATION					DAY USE VISITATION				
				1985	1990	2000	2010	None	1985	1990	2000	2010	
Zone 1 0-10 miles	None			None	None	None	None						
Zone 2 11-20 miles	Navarro	17	6.2	25835	24276	21320	19053	169222	160177	150511	132184	118376	
	Henderson	13	7.2	32632	38497	42187	40088	214990	204220	205578	203746	200496	
	Anderson	17	6.2	26525	26441	26297	26495	185137	164455	163934	163041	164269	
Zone 3 21-30 miles	Freestone	24	4.4	8080	7469	6363	5643	38174	36552	33886	24697	24389	
Zone 4 31-40 miles	Limestone	35	2.9	13609	12670	10936	9325	42369	39486	36743	21720	27912	
Zone 5 41-50 miles	Smith	47	2.05	111415	17452	129490	43559	215934	228400	240776	265454	294316	
	Cherokee	44	2.2	23042	21427	19444	16268	54189	50082	47130	40578	39937	
	Van Zandt	44	2.2	13438	12605	11032	9873	31389	29563	27731	24270	21720	
	Leon	46	2.1	6538	6094	5282	4692	14630	13729	12767	11082	9863	
Zone 6 51-75 miles	Ellis	53	1.7	42253	42139	41718	41526	71743	71830	71636	70920	70594	
	Dallas	64	1.35	186081	244947	3064919	3732341	2569845	2839619	3331265	4194689	6079983	
	Kaufman	58	1.5	26390	24696	22747	58703	39585	38385	37044	34195	31474	
	Houston	85	1.65	13323	12345	10470	8862	22688	21582	20389	17278	14820	
	Wood	65	1.35	12116	11300	9618	8351	17664	16464	15755	12984	11327	
	Polk	61	1.45	1832	1689	1449	1329	2801	2605	2618	2161	1927	
	Falls	75	1.1	14049	13126	11439	10249	16476	15453	14438	12582	11273	
	Madison	71	1.2	4968	4608	4049	3612	8234	6989	6529	4859	4384	
	Hill	56	1.6	14750	13669	11767	10479	25379	23600	21870	19427	16766	
Zone 7 76-100 miles	Rockwell	76	1.05	4622	4684	4397	4146	6189	5963	4916	4616	4382	
	Tarrant	32	0.86	817925	884042	1016910	1167156	646746	703414	766176	814747	1001714	
	McLennan	76	1.65	178108	182255	192988	208811	177835	164918	161367	202637	218891	
	Robertson	84	0.96	11019	10386	9185	8346	11175	10578	9470	8817	8012	
	Johnson	92	0.86	50796	51099	72519	65498	43896	47970	52546	62386	78938	
	Hunt	90	0.88	43347	46833	50570	55253	8140	39620	41113	44561	48622	

Market Area Day Use (Unadjusted)

Per Capita Change Rate (Base year: 1980)

Total Market Area Day Use (85%)

Total Day Use (100%)

Camping and Overnight (21%)

Total Use

Market Area Day Use (Unadjusted)	4637688	5083990	5948244	7049915
Per Capita Change Rate (Base year: 1980)	1.00	1.38	1.71	2.48
Total Market Area Day Use (85%)	4637688	5400262	6491446	11371639
Total Day Use (100%)	5397257	6491446	7491446	14111639
Camping and Overnight (21%)	1641043	1824335	2108967	3791667
Total Use	7038300	8315781	9600413	17903306

is estimated at 5%. Camping and overnight visitation and the combined total visitation is shown at the bottom of table 5.

Real estate for recreation and fish and wildlife purposes

The following public use land requirements are based on the projected visitation shown in table 5. Visitation is projected to increase over the life of the project. This will require an equal increase in the amount of public use land needed to accommodate the projected visitation. Land requirements are based on the size of the "design day load." This is the number of visitors that can be expected during the period of the year when visitation will be at a normal high, i.e., a normal summer weekend day. Participation in particular activities is based on survey results at similar Corps reservoirs.

TABLE 6
Per Capita Rates of Change

<u>Decade</u>	<u>Base Year</u>			
	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>
1970	1.00	-	-	
1980	1.22	1.00	-	
1990	1.42	1.17	1.00	-
2000	1.62	1.33	1.14	1.00
2010	1.80	1.48	1.27	1.11
2020	1.96	1.62	1.38	1.21
2030	2.11	1.74	1.48	1.30
2040	2.23	1.84	1.57	1.38
2050	2.33	1.92	1.64	1.44
2060	2.40	1.98	1.69	1.48
2070	2.44	2.01	1.72	1.51

The following participation data were obtained from Office, Chief of Engineers, Department of the Army Technical Bulletin No. 2, Estimating Initial Reservoir Recreation Use, dated October, 1969.

TABLE 7

Percent of Individual Activity Participation (summer)

<u>Year</u>	<u>Reservoir</u>	<u>Percent Picnicking</u>	<u>Percent Camping</u>	<u>Percent Swimmers</u>
1966	Denison	6 %	18%	52%
	Eufaula	10	33	55
1967	Denison	8	17	44
	Eufaula	8	44	44
1968	Denison	4	18	58
	Eufaula	7	27	32
Average		7.2%	26%	44%
Adjusted rate for Tennessee Colony Reservoir		10.0%	26%	50%

Participation rates are combined with space standards and associated planning decisions to derive the most accurate estimate of land requirements for Tennessee Colony Lake. The final result is the gross acreage requirement necessary to accommodate the design day load. This acreage is used as a basis for choosing the size and number of public use land parcels to be acquired and developed around the reservoir. The space requirements thus determined are compared to the estimated optimum visitation in table 8.

TABLE 8

Space Requirements (Acres)

	<u>Projected visitation method</u>					<u>Optimum visitation method</u>
Year	1980	1985	1990	2000	2010	
Acres	2383	2825	3351	4521	5892	5708

These space requirements are based on the estimation of land needed to accommodate campers, picnickers, and swimmers on an average summer weekend day.

The following tables show the calculations used to determine space requirements for individual activities. Tables 9 through 13 are based on the projected visitation estimates shown in table 5. Space requirements for each activity and total requirements are shown in tables 14 and 15.

TABLE 9
Recreation Analysis

Design load computations 1980

Project: Tennessee Colony

Total annual attendance: 7.3 million

Design day load

$\frac{7.3}{.61}$ total annual attendance x .59 visits during summer months
x .61 which occurs on weekends = 2.62 million total number of
weekend users

Total number of weekend users \div 26 weekend days = 100,000 design
day load.

Picnicking

Design day load x .10 of total are picnickers = number of
picnickers 10,000

No. of picnickers x .40 of picnickers requiring facilities =
number of picnickers requiring facilities 4,000

No. of picnickers requiring facilities \div turnover rate of 2
 \div 3 persons per vehicle = 670 picnic units required.

Camping

Design day load x 26 of total are campers = number of campers
26,000

No. of campers \div 3 persons per vehicle = 8,670 camping units
required.

Beaches

Design day load x .50 swimmers = number of swimmers 50,000

No. of swimmers x .60 swimmers on beach = number of beach
users 30,000

No. of beach users \div turnover rate of 3 = number of users on
beach at any one time 10,000

No. of users on beach at same time x 50 square feet of beach
per person = 12 acres of land area required for sand beach

No. of swimmers x .40 are swimmers in water = number of
swimmers in water 20,000

No. of swimmers in water \div turnover rate of 3 = number of
swimmers in the water at any one time 6,660

No. of swimmers in the water at any one time x 100 square
feet of water surface per user = 15 acres water surface
required.

10% of swimmers need no additional land.

Boat ramps

Design day load \div load factor of 3 = number of vehicles 33,300

No. of vehicles x .20 of vehicles with boats = number of boats
6,700

No. of boats \div 60 launchings per day = 112 boat launching ramps
required.

TABLE 10
Recreation Analysis

Design load computations 1985

Project: Tennessee Colony

Total annual attendance: 8.6 million

Design day load

8.6 million total annual attendance x .59 visits during summer months

x .61 which occurs on weekends = 3.09 million total number of weekend users

Total number of weekend users ÷ 26 weekend days = 119,000 design day load.

Picnicking

Design day load x .10 of total are picnickers = number of picnickers 11,900

No. of picnickers x .40 of picnickers requiring facilities = number of picnickers requiring facilities 4,760

No. of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3 persons per vehicle = 793 picnic units required.

Camping

Design day load x .26 of total are campers = number of campers 30,900

No. of campers ÷ 3 persons per vehicle = 10,300 camping units required.

Beaches

Design day load x .50 swimmers = number of swimmers 82,500

No. of swimmers x .60 swimmers on beach = number of beach users 35,700

No. of beach users ÷ turnover rate of 3 = number of users on beach at any one time 11,900

No. of users on beach at same time x 50 square feet of beach per person = 14 acres of land area required for sand beach

No. of swimmers x .40 are swimmers in water = number of swimmers in water 23,800

No. of swimmers in water ÷ turnover rate of 3 = number of swimmers in the water at any one time 7,900

No. of swimmers in the water at any one time x 100 square feet of water surface per user = 18 acres water surface required.

10% of swimmers need no additional land.

Boat ramps

Design day load ÷ load factor of 3 = number of vehicles 39,600

No. of vehicles x .20 of vehicles with boats = number of boats 7,920

No. of boats ÷ 60 launchings per day = 132 boat launching ramps required.

TABLE 11
Recreation Analysis

Design load computations 1990

Project: Tennessee Colony

Total annual attendance: 10.2 million

Design day load

10.2 million total annual attendance x .59 visits during summer months
x .61 which occurs on weekends = 3.67 million total number of weekend users
Total number of weekend users ÷ 26 weekend days = 141,000 design day load.

Picnicking

Design day load x .10 of total are picnickers = number of picnickers 14,100
No. of picnickers x .40 of picnickers requiring facilities = number of picnickers requiring facilities 5,640
No. of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3 persons per vehicle = 940 picnic units required.

Camping

Design day load x 26 of total are campers = number of campers 36,660
No. of campers ÷ 3 persons per vehicle = 12,220 camping units required.

Beaches

Design day load x .50 swimmers = number of swimmers 70,500
No. of swimmers x .60 swimmers on beach = number of beach users 42,300
No. of beach users ÷ turnover rate of 3 = number of users on beach at any one time 14,100
No. of users on beach at same time x 50 square feet of beach per person = 16 acres of land area required for sand beach
No. of swimmers x .40 are swimmers in water = number of swimmers in water 28,200
No. of swimmers in water ÷ turnover rate of 3 = number of swimmers in the water at any one time 9,400
No. of swimmers in the water at any one time x 100 square feet of water surface per user = 22 acres water surface required.

10% of swimmers need no additional land.

Boat ramps

Design day load ÷ load factor of 3 = number of vehicles 47,000
No. of vehicles x .20 of vehicles with boats = number of boats 9,400
No. of boats ÷ 60 launchings per day = 157 boat launching ramps required.

TABLE 12
Recreation Analysis

Design load computations 2000

Project: Tennessee Colony

Total annual attendance: 13.7 million

Design day load

13.7 million total annual attendance x .59 visits during summer months

x .61 which occurs on weekends = 4.93 million total number of weekend users

Total number of weekend users ÷ 26 weekend days = 190,000 design day load.

Picnicking

Design day load x .10 of total are picnickers = number of picnickers 19,000

No. of picnickers x .40 of picnickers requiring facilities = number of picnickers requiring facilities 7,600

No. of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3 persons per vehicle = 1,270 picnic units required.

Camping

Design day load x 26 of total are campers = number of campers 49,400

No. of campers ÷ 3 persons per vehicle = 16,470 camping units required.

Beaches

Design day load x .50 swimmers = number of swimmers 95,000

No. of swimmers x .60 swimmers on beach = number of beach users 57,000

No. of beach users ÷ turnover rate of 3 = number of users on beach at any one time 19,000

No. of users on beach at same time x 50 square feet of beach per person = 22 acres of land area required for sand beach

No. of swimmers x .40 are swimmers in water = number of swimmers in water 38,000

No. of swimmers in water ÷ turnover rate of 3 = number of swimmers in the water at any one time 12,700

No. of swimmers in the water at any one time x 100 square feet of water surface per user = 29 acres water surface required.

10% of swimmers need no additional land.

Boat ramps

Design day load ÷ load factor of 3 = number of vehicles 63,300

No. of vehicles x .20 of vehicles with boats = number of boats 12,670

No. of boats ÷ 60 launchings per day = 211 boat launching ramps required.

TABLE 13
Recreation Analysis

Design load computations 2010

Project: Tennessee Colony

Total annual attendance: 17.9 million

Design day load

17.9 million total annual attendance x .59 visits during summer months

x .61 which occurs on weekends = 6.44 million total number of weekend users

Total number of weekend users \div 26 weekend days = 248,000 design day load.

Picnicking

Design day load x .10 of total are picnickers = number of picnickers 24,800

No. of picnickers x .40 of picnickers requiring facilities = number of picnickers requiring facilities 9,900

No. of picnickers requiring facilities \div turnover rate of 2 \div 3 persons per vehicle = 1,650 picnic units required.

Camping

Design day load x 26 of total are campers = number of campers 64,500

No. of campers \div 3 persons per vehicle = 21,500 camping units required.

Beaches

Design day load x .50 swimmers = number of swimmers 124,000

No. of swimmers x .60 swimmers on beach = number of beach users 74,400

No. of beach users \div turnover rate of 3 = number of users on beach at any one time 24,800

No. of users on beach at same time x 50 square feet of beach per person = 29 acres of land area required for sand beach

No. of swimmers x 40 are swimmers in water = number of swimmers in water 49,600

No. of swimmers in water \div turnover rate of 3 = number of swimmers in the water at any one time 16,500

No. of swimmers in the water at any one time x 100 square feet of water surface per user = 38 acres water surface required.

10% of swimmers need no additional land.

Boat ramps

Design day load \div load factor of 3 = number of vehicles 82,700

No. of vehicles x .20 of vehicles with boats = number of boats 16,500

No. of boats \div 60 launchings per day = 275 boat launching ramps required.

TABLE 14
Activity Space Requirements

Year	<u>Picnicking</u>		<u>Camping</u>		<u>Swimming</u>
	Units Req'd.	Acres Req'd. ¹	Units Req'd.	Acres Req'd. ²	Acres Req'd.
1980	670	48	8670	1240	12
1985	793	57	10300	1470	14
1990	940	67	12220	1745	16
2000	1270	89	16470	2355	22
2010	1650	115	21500	3070	29

(1) based on 14 units/acre

(2) based on 7 units/acre

TABLE 15
Total Space Requirements
(acres)

Year	Camping	Picnicking	Swimming	Subtotal	Roads Parking Unusable	Open Space Buffer	Total
					Land	Aesthetics	
1980	1240	48	12	1300	433	650	2383
1985	1470	57	14	1541	514	770	2825
1990	1745	67	16	1828	609	914	3351
2000	2355	89	22	2466	822	1233	4521
2010	3070	115	29	3214	1071	1607	5892

After thorough calculation of the current methods of determining space requirements, it was decided that there was a severe imbalance between the recreation needs of the projected visitors and the space needs as calculated by the existing formula. Current standards are very conservative, providing only minimum space for the types of facilities now offered. The public response to these basic facilities frequently exceeds projected visitation rates. This response indicates the importance of recreation in today's society and more than justifies its inclusion in benefit-cost analysis of these projects. From the private sector's perspective, such perspective, such high attendance would be a sound basis for expansion of the variety and number of recreation facilities. From the public sector's standpoint, this high visitation reflects the high social value of recreation facilities to the public. Many studies emphasize the value of social benefits derived from recreational activities and the

need to maintain permanent open space for outdoor recreation.* The need for quality public recreation opportunities continues to grow as the nation grows and becomes more and more urban and leisure oriented.

Although the function of the Corps of Engineers is not primarily involved with recreation, by the construction of major public resources which are in high demand for recreational purposes (water activities being the most popular types of recreation), it has been forced into the recreation business. Now as a major national caretaker of water resources with high recreation demand, the Corps must bear the responsibility of providing land and facilities for recreation commensurate with the value of the scarce resource base. The obvious deficiency of current policy cannot be acceptable in an era when future planning has advanced to the stage of recognizing current deficiencies and providing gross estimates of future needs.

Whether recreation areas are managed by the Corps or another agency, Corps planning must include recommendations for the purchase of adequate recreation space. How much land is deemed adequate is difficult to determine, but with projections of visitation to Tennessee Colony Reservoir increasing to 17 million or more per year, estimated space needs of about 5,700 acres as computed by the above method seems discouragingly small. The days are not too far in the future when there will be a great demand for the purchase of public use land around the entire reservoir rather than the current policy of purchasing small tracts for public use at selected locations on the reservoir. The recommendations of this report call for the purchase of about 9,500 acres of park land around the reservoir. In addition, about 4,000 acres of public land for group use, and the dedication of 24,000 acres of floodplain land for the management and preservation of wildlife is recommended. This is deemed sufficient to provide at least enough space to accommodate a more satisfactory variety of recreational interests and activities and maintain their individual integrity by the prevention of overcrowding on a land space too small and with too many kinds of facilities.

Environmental considerations must also gain importance in the development of public use areas. The impact of overcrowding park lands has the effect of destroying much of the natural beauty of the site, upsetting the local ecology and above all, preventing the users

* For example see Outdoor Recreation For America, Outdoor Recreation Resources Review Commission, 1962, USGPO, Pp. 22-24.

from obtaining a quality experience from their visit. Providing adequate land and its proper development into intensive use, moderate use, and extensive use serve to prevent site degradation. The Corps has a responsibility to maintain the quality of the reservoir as a public trust. This not only includes the water but also the surrounding land. Ideally, land could be purchased for public use around the entire project 1/4 to 1/2 mile or more in width. Experience of past projects has shown that greater purchase of public lands would have significantly increased the environmental quality in many aspects ranging from improved water quality to a more aesthetic surrounding. However, practicality dictates the limitations of land purchased for public use adjacent to the reservoir. What is recommended is that the practical considerations be influenced by the ideal to optimize the benefits of public ownership.

As environmental concern spreads to new aspects and areas of interest, there may be considerable criticism against the current Corps land acquisition policies for not properly protecting the public water resource placed in its trust. The original recommendation of less than 2000 acres of park land is negligible when compared with the total size of the project. It is ironic that 4 1/2 times as much additional land was recommended for purchase for the benefit of fish and wildlife as was recommended for public use.*

An examination of the original costs and benefits of the Tennessee Colony project casts further doubt on the appropriateness of recommending purchase of only 1,907 additional acres for public recreation. The purchase cost for the 1,907 acres was estimated at \$451,000, or 4.3% of the total recreation development costs and only 0.2% of the total estimated cost of the project. This shows that the land cost is a minor portion of the recreation costs and an insignificant portion of the total cost. This being true, additional land could easily be purchased with a relatively small additional expenditure. The additional expenditure is further justified when the relative benefits are examined. Total annual benefits are estimated at \$15,828,600. Out of this total, \$4,050,000, or 25.6% is attributed to recreation, fish and wildlife. Compared in another way, total estimated recreation construction costs amount to 5.4% of the total project construction costs while annual recreation benefits amount to 25.6% of the total annual benefits.**

* House Doc. No. 276 (89th Congress, 1st. Session), Trinity River and Tributaries, Texas, Vol. V, USGPO 1965, P. 15.

**Figures are derived from data obtained from US Army Corps of Engineers; House Doc. No. 276, 89th Congress, 1st. Session, Trinity River and Tributaries, Texas, Washington, D.C., USGPO 1965, Vol. 1, Pp. 131-136, Pp. 160-161; Vol. V. Pp. 15-17.

Corps recreational plans must consider uses other than camping, picnicking, boating, and swimming. This may have been a sufficient scope for Corps reservoir recreation areas 10 years ago, but it is deficient today given a population with a shorter work week, increased income and broadened interests in recreational activities. While many of these new activities are not directly water related, the participants prefer areas located near water to increase the number and variety of activities in which they may potentially engage. Thus, visitors will spend part of their time with water related activities in which they may potentially engage. Thus, visitors will spend part of their time with water related activities and part of their time with activities not water related. For example, the swimmer may desire to ride a mini-bike, the boater may want to walk a nature trail, or the picnicker may wish to play golf. The appeal of a recreation area which can provide both water and land related recreation activities is substantially enhanced. This gives family members with varying recreational tastes an opportunity to engage in the activity which he prefers. For example, women and children are often left without an opportunity to engage in a rewarding and pleasureable recreation experience while husbands are gone fishing because no other facilities exist near a campground or boat launch. A nature trail, a golf course, or a resort complex could offer opportunities for a number of recreational interests and needs. Corps planning must foresee these situations and develop alternative opportunities to prevent their occurrence. This report recommends an increase in the number of activities provided for on public use land.

Construction costs for the Tennessee Colony project will be shared on a 50-50 basis with the Trinity River Authority. This cost sharing will include the cost of recreation site acquisition, the development and all of the operation costs. However, T.R.A. has no source of funds to finance the project and it is assumed that they will have to borrow from the Texas Water Development Board bond revenue for acquisition and development. In order for T.R.A. to cover operational costs and debt retirement, it will be solely dependent on revenue producing types of facilities. But activities at conventional Corps recreation facilities are not high revenue producers and financing would probably be impossible for T.R.A. More intensive uses of recreation land areas are needed to attract higher revenue producing concessionaires. High quality resort areas with various revenue producing activities will be necessary to permit a source of revenue from which T.R.A. can operate.

The following activities which are in consonance with current Corps policy should be included in reservoir recreation planning:

1. resorting
2. bicycling
3. horseback riding
4. hiking
5. nature walks and bird watching

Optimum capacity space requirements for these activities on Tennessee Colony Lake are shown on the following pages.

Resort complexes 1300 acres

With the high visitation estimated for Tennessee Colony Lake, high density areas will be desirable to concentrate some of the use resort complexes constructed on concession basis on Corps land are a desirable feature. For planning purposes 1300 acres is recommended for the development of 2-3 resort complexes at high intensity use locations around the lake. These areas are envisioned as containing both hotel and cabin facilities, shops and services, and a full complement of outdoor activities including golf, swimming pools, tennis, shuffleboard etc. as well as terminal facilities for horse and bicycle trails.

Trail requirements 2525 acres

Information on trail requirements is difficult to obtain since renewed interest in these activities is so recent. Lack of trails in Texas is evident by the following table.

TABLE 16
Existing and proposed Federal and State Administered trail
mileage, 1966

<u>Area</u>	<u>Type of trail</u>	<u>Total, all trails*</u>	<u>Foot</u>	<u>Horse</u>	<u>Bicycle</u>	<u>Motor- bike</u>	<u>Pro- posed</u>
US		102,589	97,533	79,384	4,883	25,390	59,740
Texas		379	153	209	17	0	198
Texas percent of U.S. total		0.4%	0.15%	0.26%	0.35%	0%	0.3%

Source: Bureau of Outdoor Recreation Selected Outdoor Recreation
Statistics 1971

* Total mileage may differ from the sum of individual types because of multiple use

Despite the dirth of facilities, participation in these activities appears to be good as shown in the following table.

TABLE 17
Outdoor recreation activities, percentage of population 12
and over participating, Sept. 1964-Sept. 1965.

<u>Activity</u>	<u>US</u>	<u>West South Central Region</u>
Walking	51%	35%
Bicycling	19%	17%
Horseback riding	10%	12%
Nature walks	16%	11%
Hiking	9%	8%
Bird watching	6%	5%

Source: Bureau of Outdoor Recreation, Selected Outdoor Recreation Statistics, 1971.

This information is useful in determining land use requirements based on design day load. However the figures cannot be applied directly and the following modifications are therefore necessary. First we must have some idea of the number of summertime participants. The table below gives useful information on this subject.

TABLE 18
Outdoor recreation activities; percent of population 12 and
over participating, annual and summer.

	U.S.	
	Annual	Summer
Walking	51%	48%
Bicycling	19%	16%
Horseback riding	10%	8%
Nature walks	16%	14%
Hiking	9%	7%
Bird watching	6%	5%

Source: Bureau of Outdoor Recreation Selected Outdoor Recreation Statistics, 1971.

Table 18 shows that nearly all participants engage in these activities in the summer as opposed to the rest of the year.

The second step in applying the information is to determine what percentage of the design day load can be expected to participate. Here, information is not available and we must therefore make an assumption. It is assumed that each visitor who uses trail facilities will participate in an individual trail activity only once per year, i.e., no matter how many times a person visits the reservoir, he will only participate in any one trail activity one time per year.

Finally, if we assume participation only once per year, we must estimate what percentage of the design day load consists of repeat visitors. Analysis of figure 1 and Table 5 shows that on the average, there will be about 2 visits per year per person within the market area. If this is true, about half of the design day load would consist of repeat visitors. Consequently the estimated rate of participation would be about half the annual participation rate. Estimated participation is shown below.

TABLE 19
Rate of Recreation day Participation

	Annual participation rate	Probability of participation on a given recreation day
Bicycling	17%	8%
Horseback riding	12%	6%
Nature walks	11%	5%
Bird watching	5%	2%
Hiking	8%	4%

*Percentages are rounded down to reflect slightly lower summertime participation as noted in Table 18.

Using the participation rate above, an estimate of design day load participation can be made.

TABLE 20
Estimated Participation, Tennessee Colony Reservoir

Year	1980	1985	1990	2000	2010	Optimum
<u>Activity</u> <u>Rate</u> DDL	100,000	119,000	141,000	190,000	248,000	240,000
Bicycling 8%	8,000	9,520	11,280	15,200	19,840	19,200
Horseback riding 6%	6,000	7,140	8,460	11,400	14,880	14,400
Nature walks 5%	5,000	5,950	7,050	9,500	12,400	12,000
Bird watching 2%	2,000	2,380	2,820	3,800	4,960	4,800
Hiking 4%	4,000	4,760	5,640	7,600	9,920	9,600

Trail Standards

There are no precise trail standards available which give use density or trail sizes. Various standards are used by recreation planners, but the applicability to a particular project or their

accuracy is unknown. For example, Outdoor Recreation Space Standards lists the following trail standards.*

TABLE 21
Trail Standards

	Trail Density	Trail Width	Trail Zone*	Turn-over
Bicycling	None	None	None	None
Horseback riding	1 horse/mile	Narrow track to 10 ft.	None	2
Nature walks	20-90 persons/mile	4-10 ft.	None	1.5-8
Hiking	4-40 persons/mile	Narrow as possible up to 10 ft.	None	5
Bird watching	None	4-8 ft.	None	None

* Width of trail plus area on both sides of trail to fulfill purpose, for buffer and aesthetics.

* Bureau of Outdoor Recreation, Outdoor Recreation Space Standards
USDI, BOR 1967 Washington, D.C.

The following guidelines were used to determine the land requirements for trails.

TABLE 22
Selected Trail Standards

	Visitors per mile	Turnover rate	Trail zone	Acres per mile of trail
Bicycle	15	12	100 Ft.	12.12 acres
Horseback riding	15	8	100 Ft.	12.12 acres
Nature walks	40	6	150 Ft.	18.18 acres
Bird watching	25	5	150 Ft.	18.18 acres
Hiking	20	6	200 Ft.	24.24 acres

Space requirements can now be determined. The land requirements for optimum visitation are shown in Table 23 below:

TABLE 23
Minimum space requirements for optimum visitation

[illegible]

Trail areas of this type are subject to multiple use of the land for other trails or other uses. If multiple use is desired, the land requirements for trails can thus be reduced. Caution must be used when the trails are considered for multiple use. Some types of trail uses are not compatible with other trail types e.g. bike and nature trails or horseback riding and bicycle. However, multiple use of trail lands is often used. A factor of between 1.5 and 3.0 can probably be used when multiple use is desired, the number depending on either the amount of crowding which is desirable or permissible or other guidelines. For Tennessee Colony, multiple use of trail lands was considered desirable at a level which would permit the area to remain in a natural state, and not cause the user to have a feeling of being crowded while on the trail. A factor of 2.5 was estimated to meet these requirements. Resulting acreage requirements are shown below.

Total acreage, $6305 \div 2.5$ multiple use factor = 2525 acres required.

Total park land requirements recommended for optimum visitation at Tennessee Colony Reservoir are shown below:

Camping	2971 acres
Picnicking	114
Swimming	28
Roads, parking, unusable land etc.	1038
Aesthetics, open space, buffer etc.	1557
Trails	2525
Resorts	1300
TOTAL	9533 acres

VI. Recommended plan of Development

Outdoor recreational activities desired by users

see sections IV and V

Proposed recreation development

A recreation development must consider several groups of elements which all interact in the actual operation of recreation areas. Some of these groups are the natural resource base, visitation use pressure, visitor preferences, and transportation networks. The groups, considered both separately and together, form the basis for a systems approach to the development of recreation around the Tennessee Colony project.

The basic element in recreation development is people--who they are and where they come from. The major concentration of population is in the Dallas-Fort Worth urban area. If current trends continue we can expect the typical visitor to be lower-middle class or above. This is due to the distance to be traveled and also because the recreational habits and desires of this class find expression in a water based recreation area with its camping, boating, fishing and other associated land activities.

The second element is transportation. People must be able to get to the recreational facility if they are to recreate--the quicker the better, from the individual's viewpoint. From a demand standpoint, the quicker and easier the route, the greater the volume of users. Interstate 45 is the main traffic corridor serving the proposed project, U.S. 175, 287, 84 and Texas 31 are secondary traffic corridors. The high level of highway connectivity to Tennessee Colony Reservoir prophecies a high level of visitation.

The third basic element is the attraction centers. These are determined by connectiveness, aesthetics, and existing nuclei which act as growth points for facilities and services. Using these criteria, a hierarchy of attraction centers can be determined with a corresponding hierarchy of services and facilities.

The conceptual approach of this plan is a hierarchical ordering of sites. The plan recommends a few very high intensity use clusters, some moderately high intensity use clusters, with low intensity use areas in the interstitial spaces. As recreation visitation increases, the high intensity use areas should broaden their resource base with more facilities. The interstitial sites will gradually move to more intensive use.

The logic behind this concept is quite simple. The organization of human activity is essentially hierarchial and focal in character. The nodes about which human activity is organized are agglomerations of varying sizes. The size of these nodes appears to be a function of accessibility. The intensity of human activity tends to diminish systematically with distance from these nodes. As activity increases over time, growth is experienced most strongly at the highest use node or cluster. However recreation activities do have capacity levels and if they are exceeded, the satisfaction or reward of the recreation experience diminishes. The planner, through the addition of facilities and access improvements can spread the visitation from first order sites to second order sites.

The third order sites, located in the interstitial spaces will exhibit low intensity use. Their resource base will be the most undisturbed natural setting. Only a minimum of improvements will be necessary on some of these areas. For some areas, leasing to ranchers for grazing of cattle or for other compatible purposes will be desirable before recreation needs requires the use of that land.

The following visitation patterns are predicted for Tennessee Colony Reservoir (refer to plate location map).

1. Very high intensity use (first order sites) will occur along US highway 287 on the west side of the lake. This intensity of use will also spread to the south side of Richland Creek along FM 488.
2. Slightly lower use, but still of high intensity will occur in three areas: at Trinidad and the surrounding area along Texas highways 31 and 274 on US highway 287 on the east side of the lake, and around the vicinity of Tennessee Colony Dam, on both the east and west sides of the reservoir.
3. The remaining areas will receive moderate to low intensity useage.

Once the visitation pattern had been predicted, the individual sites were selected on the basis of the following considerations. Access to thoroughfares and relationships of visitor origin were important in predicting areas where visitation would naturally be high. Highway maps and coordination with highway planners were the basis for determining the future highway pattern. This pattern must be considered a relatively fixed resource in planning ease-of-access, especially to intensive use areas. Local features of topographic, vegetation and cultural interest are important in influencing the location of a particular site. Aerial photos, topographic maps, and field reconnaissance were useful in locating areas with these desirable characteristics. Reservoir hydrology also enhances or detracts from the desirability of using adjacent shore and upland for public use. Hydrolic data were limited as they have not been fully developed by Corps Hydrologists.

The selection of sites began by locating prospective areas on aerial photos noting shoreline characteristics and vegetative cover. Additions and modifications were then made by considering highway access and topographic relief. Field reconnaissance was then used to verify, modify or reject the selected sites and determine locations of additional sites. Final site locations attempted to include a maximum of shoreline and at the same time form land masses on which a variety of recreation opportunities could be provided while at the same time relating the site perimeter to existing boundaries when possible (see Table 24).

It should be emphasized that these sites and their boundaries are not recommended as the final locations and boundaries. They are recommended on the basis of the procedure outlined above being identified as generally desirable for public use from both resource and visitation standpoints. Further site analysis will be necessary to determine if undiscovered adverse factors exist which would make public use undesirable. Individual site selection study was necessarily limited in depth of analysis by the terms of the contract.

TABLE 24
Site Selections

<u>Land Category</u>	<u>Recommended Size</u>		
	<u>Upland*</u>	<u>Area below Flood pool**</u>	<u>Total</u>
<u>Park Areas</u>			
Tennessee Colony Locks	292	40	332
Rocky Branch	1094	294	1388
Amerada Camp	397	149	546
Cottonwood Creek	518	176	694
Tehuacana Peninsula	1062	450	1512
Alligator Creek Peninsula	850	742	1592
Roundhouse	208	172	380
Chambers	178	242	420
Yonker Pin Slough	595	533	1128
Rush Creek	525	143	668
Goodnight	437	251	688
North Trinidad	91	62	153
Trinidad Peninsula	304	341	645
Tennessee Colony Headwaters	200	219	419
East Cedar Creek Dam	595	299	894
West Cedar Creek Dam	243	167	410
Walnut Creek	141	67	208
Turkey Creek Point	85	50	135
Wildcat Creek	127	111	238
Roustabout Camp	132	225	357
Bethel	606	128	734
Saline Branch (less Yacht club)	221	86	307

TABLE 24 (cont.)

<u>Park Areas</u> (cont.)	Recommended Size Area below		<u>Total</u>
	<u>Upland*</u>	<u>Flood pool**</u>	
Green's Bluff	468	716	1184
Cook's Corner	164	493	657
TOTAL PARK AREA	9533	6156	15689
 <u>State Park</u>			
Trinity River	2073	417	2490
Big Brown Creek	68	42	110
TOTAL STATE PARK	2141	459	2600
 <u>Service Clubs/Group Camps</u>			
Rural Shade	1091	550	1641
Bear Creek	342	225	567
Cayuga	489	271	760
TOTAL SERVICE CLUBS/ GROUP CAMPS	1922	1046	2968
 <u>Yacht Club</u>			
<u>Saline Branch (south end)</u>	<u>100</u>	<u>57</u>	<u>157</u>
 <u>Totals</u>			
Total Recommended Public Use	9533	6156	15689
Total Other Uses	4163	1562	5725
TOTAL PUBLIC USE	13696	7718	21414

* Includes only land above flood pool level

** Includes only land between conservation pool level and flood pool level.

Proposed Initial and Future Development

Listed below are the recommended developmental features of the selected sites. Development characteristics are described only in general terms.

Tennessee Colony Locks (Plate 1)

This site will provide public access to both sides of the dam and be the only access to observation of the locks. Additionally, it will provide the only area for fishing immediately downstream from the dam. Downstream accessibility is important to many fishermen who do not have a boat. Parking and interpretive signs for lock visitation are needed as well as parking for downstream fishermen and possibly a small campground.

Rocky Branch (Plate 1)

It is anticipated that this area will receive high usage in conjunction with the dam and locks visitation. Possible features could include an interpretation center for the locks and dam combined with a scenic overlook, marina, hiking or bridle trails, in addition to boat ramps, camping grounds, swimming and picnic areas. It is strongly recommended that borrow material for the dam be taken from an area to be inundated and not from this site.

Big Brown Creek (Plate 1)

A new farm to market road is being constructed which will cross Big Brown Creek at the dam and provide access to this site. No other roads exist within the site. Recommended use: boat launch, camping and picnic area. Possible use as interpretation of the power plant on the north side of the dam. This site may be leased to the state park which is located on Lake Fairfield (Big Brown Lake) thus giving the state park access to the Tennessee Colony Reservoir. Low intensity use is anticipated.

Bear Creek (Plate 2)

Initially, this site is accessible only by water and is recommended for use as a primitive group camp or service club area. Road access may be developed on existing ranch trails. Natural divisions of the site by indentations of the shoreline make natural divisions for accommodating more than one group on the site.

Amerada Camp (Plate 2)

At Amerada Camp, facilities for swimming, camping, picnicking, and boat launch are recommended.

Cottonwood Creek (Plate 3)

This site is well located to serve visitors traveling I-45 from the south. Camping, swimming, and boat launch areas are needed. The almost complete forest cover suggests use for nature trails, hiking, bird watching etc.

Tehuacana Peninsula (Plate 4)

This site serves as a natural promontory area for the intensive use sites on the north end. There are excellent camping and swimming areas with a splendid view. A livery stable at the north west corner could supply horses for a trail along the south side of Richland Creek, which is being proposed as a national wildlife area. Other trails are also recommended. A replica lighthouse or other prominent attraction would add charm to the eastern point and provide service space for administrative purposes. Cabins and a small marina could be located at this site.

Chambers (Plate 4)

High public use can be anticipated since this is the first site the visitor will see if he travels the main traffic corridor from the Dallas region. Boating ramps will provide access to the upper reaches of the Richland and Chambers Creek areas of the lake. This site is expected to serve as a large boat launching point, consequently some land has to be allocated for parking lots, boat ramps and activities to occupy those people (women and children) who are often stranded on the shore. Nature or bike trails could be one option for use.

Alligator Creek Peninsula (Plate 4)

This area combined with the Roundhouse site is predicted to receive the highest intensity use. It will require the most capital investment and the most annual operating costs. Many of the activities on the site can be provided on a leased concession basis. The central focus should be a high capacity resort complex with a diversity of activities. Swimming, both on a developed beach and in swimming pools is recommended. Marina facilities should be connected with the resort and nearby, golf, tennis, miniature golf, shuffle board, bicycling and other outdoor activities are required. There will be need for many shopping areas, restaurants, night time activities and other services which can be either provided by private enterprise on the north side of highway 287 or on concession basis on Corps land. Detailed planning should be used to provide continuity and overall direction to the developments which occur in the area. Temporary structures and haphazard facilities should not be permitted. The existing levee on Richland and Chambers Creeks should be investigated for feasibility of being retained as a walkway or fishing pier

for at least a portion of its length. There may be a possibility of allocating the bowl-like area between the levee and the protected shoreline for water spectator sports e.g. speed boat races and water skiing shows similar to Cypress Gardens. The levee could be used for bleachers or a large "boatel". The levee could also serve to separate conflicting water uses e.g. water skiing and pleasure boating on one side and fishing on the other.

The peninsula, which will be one end of the causeway, would be an excellent area for a large central attraction center such as a tower restaurant, a Texas Cultural Center or an interpretation center for the Trinity Ship Channel. There can also be some picnicking away from the middle of the resort area. Camping is not recommended. A study should be carried out to test the feasibility of instituting a tourboat service. This service would also be on a concessional arrangement.

Roundhouse (Plate 4)

The development of Roundhouse should act to compliment the Alligator Creek Peninsula site. More extensive activities such as picnicking, some camping, marina, and golf could be accommodated here. The area to the north of US 287 should develop privately into housing and business which should compliment the Corps developments.

Yonker Pin Slough (Plate 5)

Access and topography suggests minimum improvements be made. Usage could be for hunting, nature study, and possibly group camping. Development should be considered for the lower area only since the upper area is subject to periodic flooding. This area may also serve as a "safety valve" for the high intensity area to the south. It could be used to provide facilities which could not be placed in the intensive use area.

Rural Shade (Plate 6)

The flood plain completely surrounds this large site which, at high water, would make it an island. It is unlikely that this will occur often enough to hamper its use and permanent access is possible by raising the road elevation a few feet. The area is large enough to be leased for several group camps along the water with the center being held for their common use. The eight small ponds which now exist should be integrated into the overall camp use.

Rush Creek (Plate 6)

Being about midway from two intensive use areas, this area may be best utilized as an unimproved area. Future uses would have developmental possibilities here on a site where present access is difficult. The site has good vegetative and topographic qualities

and will be in high demand as the reservoir area develops. Initially grazing or other leasing arrangements should be considered for its use.

Goodnight (Plate 7)

Moderate intensity of use can be expected at this site. The lake shore area is well suited for camping and picnicking developments and hiking trails while nature trails and possibly, if demand warrents, golf.

Trinity River (Plate 8)

This area is suitable and recommended for state park acquisition. The land is arranged in such a manner that it lends itself to intensive use at the southern end and gradually less extensive use toward the northern end. It is recommended that this parcel be integrated with the large portion of flood plain on the northern end of the lake which would be ideal for a wildlife management area. The rugged topography is ideal for hiking trails and bridle trails. Erosion problems have to be considered during the designing stages. Numerous islands exist in the river, some which may be desirable for inclusion in this site.

Tennessee Colony Headwaters (Plate 8)

Barring water quality problems, the area would be well suited for use as a resort complex with an 18 hole golf course and horse and bike trails leading into the large adjacent wooded floodplain. The area should retain the wooded characteristics which now exist and these should be reflected in the type of facilities constructed.

North Trinidad (Plate 9)

The land to the west of route 274 is expected to develop rapidly with vacation homes and/or trailer parks. This site will serve these people and protect the water against encroachment. Swimming and picnic areas and several boat ramps are recommended. This would provide access to home owners on the peninsula between Cedar Creek Reservoir and Tennessee Colony Reservoir.

Trinidad Peninsula (Plate 7)

This site is well served with roads. It has excellent setting as it is in juxtaposition to the town of Trinidad which is expected to grow as large recreation nucleus and service town. However, poor soil conditions may limit the possibility of uses on this area. Day use activities and facilities can be provided and many types of trails could be developed on this flat land. The area has a particularly

extensive shoreline and good road access making shore fishing a probable activity.

Cedar Creek Dam, East and West (Plate 9)

Intensive development of these sites is recommended to accommodate the high visitation expected in this area. These two sites represent the best area to channel the large crowds. The two sites should be able to accommodate a complete range of recreational activities. Some connection between Cedar Creek Reservoir and the Tennessee Colony Lake should be explored to transfer boats between the water bodies.

Walnut Creek (Plate 10)

This site is located away from the main stream of activity and is expected to have low intensity use. It will offer a good location for uncrowded boat ramps, camping and picnicking as well as an excellent view of the lake. A levee existing along much of the shoreline has numerous possibilities for use if protected from erosion. It would provide a place to fish, walk and hike, bicycle, and provide wave protection to boats anchored between it and the shoreline.

Turkey Creek Point (Plate 10)

A low intensity of use is expected on this area due to its location. Boat launching facilities are recommended as well as other minimum day use facilities.

Wildcat Creek (Plate 11)

The shape and topography of this area would be ideal for camping. Road access is very good and the long shoreline would give campers a good chance to be near the water. The site also has some historical interest as two old roads merged at this point. Additionally, a ferry landing was located here for shuttling people across the Trinity River. Proper interpretation should be provided for the historical aspect.

Roustabout Camp (Plate 11)

Receiving large visitation from US 287, this area should be provided with fairly intensive development. Boat launching will be a major activity and marina facilities will be required. A sheltered harbor may exist on the north side of US 287 making an excellent harbor site. In addition, the area is divided into 4 or 5 sections making natural barriers between activities. One unusual feature of this site is the existence of a fish hatchery which presumably will not

be inundated and will continue to be in operation. This would make a very good tourist attraction. The oil field in this area has numerous well and pipeline fixtures throughout the area and may cause some problem to recreation development if they are still in operation. It is recommended that these fixtures be either removed, screened, or made available for interpretation to the public, safety factors and operational considerations permitting.

Cayuga (Plate 11)

It is recommended that this site be leased to service clubs or groups for camps and retreats. The inlets will be ideal for swimming, fishing and boat launching. The inlet divides this site into 3 natural units which could be used for conflicting uses or act as natural divisions for three group leases.

Bethel (Plate 11)

It is suggested that this area be preserved in a natural state for at least the initial years of the project. Being a large area and away from the heaviest traffic, it is felt that the area should be leased for grazing or left to activities such as primitive camping and hiking. As visitation increases, development should consider the changing desires of recreationists and provide facilities in consonance with these desires.

Saline Branch (Plate 11)

A natural harbor is formed on the southeast portion of the site. This area is recommended for use as a yacht club as the harbor promises to be deep and the lake in this area is at its maximum average depth. There should be no obstacles to sailing in this area.

Green's Bluff (Plate 1)

The development of this area should take into account the Gus Engeling Wildlife Management Area to the east. The success of the wildlife management area depends largely on their ability to control human activity within the area. Consequently, the orientation should center around conservation oriented activities on the lake on the land. Nature trails, a nature center, and wildlife exhibit would be examples of these activities.

Cook's Corner (Plate 1)

This area should be used for wooded campsites on the long point and denser camping, swimming and boat launching on the area near the dam. It is very important to leave the trees and not to scourge this area for dam fill during the construction of the dam. Private development is expected to occur on the north side of the road.

Fish and Wildlife Conservation and Enhancement

Fishing habitat promises to be very good in Tennessee Colony. The lake will require proper stocking and monitoring for undesirable species. Pollution may be a problem on some portions of the lake (see section VIII). Some tree stands should be left scattered in various places around the lake, especially in shallow bays and in shallow stream beds. However, the majority of the forest stand should be cleared from the lake to allow for a variety of uses on the lake.

Wildlife enhancement will occur with the designation of the floodplains of Richland and Tehuacana Creeks as a National Wildlife Refuge. In addition, the 13,800 acres of floodplain on the north end of the reservoir should be designated for wildlife management. Many of the public use and group areas will have open space and forest land conducive to the production of wildlife. The proper placing of facilities in clusters, use of practices which enhance wildlife production and the maintenance of forest and meadow areas will allow these areas to serve as desirable wildlife habitat.

Forest Resource and other Vegetative Programs

Public use areas will require a variety of vegetative cover to best serve its various activities. Although much forest cover exists on the areas recommended for purchase, many acres of land will require modification with planting programs. There is a need for extensive pine planting in areas where these trees can grow since very few pines now exist on the sites. Pine will add needed variety to the forest cover and provide winter cover and color where little now exists. Other tree shrub and grass plantings should be used to add variety to the scenery. Some open grasslands are needed in addition to forests. Grasses should stabilize soil and prevent erosion while also standing up to at least a moderate level of traffic.

All plantings should begin at the earliest possible time, especially tree plantings in order that reasonable growth can occur prior to development for public use.

VII. Coordination with other agencies

Coordination during the course of this study was effected with BSWF to determine the location of proposed national wildlife refuges; with three Texas Highway Department district offices over future highway plans and with the Texas Parks and Wildlife Department concerning the development of a state park on Lake Fairfield (Big Brown Lake).

VIII. Identification of Special Problems and Recommended Solutions

Protection from resource encroachment

Often the first difficulty encountered by agencies responsible for developing resources such as Tennessee Colony Lake is the encroachment of private interests on potential public use areas and the general escalation of land costs which takes place between the time the proposed project is announced and the time the particular agency is prepared to acquire the property beyond the basic development needs. It is the primary function of this report to determine the optimum - both qualitatively and quantitatively - public use areas, and encourage the purchase of these properties simultaneously with the lands required for inundation by the impoundment. Since public recreation is one of the stated objectives of Tennessee Colony Lake, such pre-development acquisitions should need no further justification.

Provisions for aged and handicapped

The aged and the physically, emotionally and the mentally handicapped in the United States, thanks primarily to the increasing ease of mobility, are seeking, and are entitled to, outdoor recreation experiences available on public lands. In fact, these people may have an even greater need for such outings than other recreationists. Often better planning of new outdoor recreation areas, or a few modifications of old ones, can provide handicapped persons of any age with an enjoyable and memorable experience instead of one that is frustrating or hazardous.

Realizing this, the following developments are examples of facilities modified to accommodate the handicapped:

1. Specially designed areas around existing tanks located on park land for use by handicapped;
2. Maintenance of portions of existing levees for use as fishing areas for handicapped;
3. Short, gently sloping, paved, self-guiding nature trails;
4. Animals mounted along nature trails with rope leads so that blind persons may touch them and "read" their exhibit signs;
5. Interpretive signs in very bold print and/or braille;
6. Paths and paved walkways to restrooms;
7. Restrooms with ramps and handrails; enough space inside to maneuver wheelchairs; cubicles with wide doors, handrails and benches; and special clothes-hanging facilities;
8. Picnic tables with spaces for wheelchairs; and
9. Low water fountains.

Conflicts with other agencies

Among the proposed public use areas on Tennessee Colony Lake, the only known area of dual interest among public agencies is the floodplain in the area labeled Tehuacana Peninsula in this report. The Bureau of Sport Fisheries and Wildlife has proposed that this entire area be designated a National Wildlife Refuge while this report has recommended that a 1512 acre tract of land on the point of the peninsula (450 acres of which are floodplain) be developed as a park area.

The proposed Tehuacana Peninsula park area is considered vital to the optimum development of Tennessee Colony Lake. As has been related previously in this study, the Tehuacana Peninsula site is expected to be in the most intensely visited areas of the entire lake and adequate park space will be vital if projected visitation is to be accommodated. The use of this point of the peninsula could be preserved in such a manner as to permit dual use as a park in the summer and as a bird refuge in the winter.

Regulatory requirements

In order to eliminate future operation and management problems, the surface of Tennessee Colony Lake will be zoned as soon as the impoundment is completed. The conflict of special interest groups and specific activity participants is becoming increasingly common on public lakes and such a zoning plan implemented simultaneously with the development of the lake should eliminate or reduce such problems. Tennessee Colony will be a relatively large lake and it may be conceivable to zone the largest expanses of water for open use, but the branches, shallows and areas immediately adjacent to public use areas should be restricted according to appropriate uses.

Other problems

Pollution and potential pollution sources are currently attracting a great amount of attention across the United States. It appears that one of the unfortunate by-products of progress in this tremendously industrial and technical age is the contamination, in varying degrees, of most of our natural resources. Tennessee Colony Lake certainly has a number of these potential pollution sources.

Immediately there will be a danger of pollution from unchecked sewage disposal infiltrating into the ground water, and from surface water runoff carrying fertilizers applied to adjacent pastures. Also, periodic heavy pollution may be expected near the NIPAC fertilizer plant outfall causing a potentially critical eutrophication problem in the upper portion of the lake. Regular checks on nutrient levels

and general water quality should be performed and facilities for the treatment of domestic and industrial wastes should be continuously improved.

The inundation of several oil fields will create a source of pollution by oil and oil field brines. If these and existing gas fields continue to operate, oil-pumping and storage stations and oil and gas lines must be either elevated above the future water level or relocated out of the lake area.

The strip-mining of lignite north of Fairfield for use as fuel to generate electric power in the Big Brown Lake power plant northeast of Fairfield poses a possible pollution problem. These lignites contain sulfur and perhaps mercury compounds, and apparently neither sulfur dioxide gas nor mercury vapor, if present, will be removed from the stack emissions of the power plant. Dispersal of these gasses by the wind would have adverse effects in the down wind areas, including the lake and its drainage areas. An increase in the acidity of surface waters is another possible side effect of this operation, and the myriad of power lines associated with the Big Brown Lake and Trinidad power plants definitely constitutes a visual encroachment around the lake and its contiguous areas.

The magnitude of visitation to the public use sites, coupled with anticipated subdivision and resort developments on adjoining private lands, necessitates front-end consideration of regional sewerage collection and treatment facilities. The location and financing of such facilities will be a major determinant as to land usage around the reservoir. Federal and State requirements for waste water treatment dictate initial planning for these utilities simultaneously with public use areas and general reservoir area planning.

Planning for public use areas is merely a portion of the social and moral responsibilities of agencies creating new resources of the magnitude and significance of the Tennessee Colony Reservoir. This creation will inevitably beget tremendous increases in second homes, retirement homes, resorts, and all the necessary supporting service enterprises and facilities, including the attendant vehicular traffic and the need for fire and police protection. Long before the year 2020, the periphery of the reservoir will possess all the attributes of an urban region, with none of the institutional devices to guide, direct, and service such a complex.

Land use and institutional planning on a reservoir-regional basis is important and it is hoped that this is accomplished in advance of construction. Failure to do so is evident on nearby Cedar Creek or Livingston Reservoirs.

IX. Management and cost sharing

Information in this section to be determined by appropriate Corps regulations and staff sections.

X. Environmental Quality

While several aspects of environmental quality have been presented in sections II, VI, and VIII of this report, the following additional factors are identified.

1. In addition to the potential water and air pollution problems associated with the two power plants adjacent to the reservoir site, a large number of high tension power lines and poles will be present around the reservoir. These poles and lines are a detraction from the aesthetic quality of the reservoir and the surrounding park areas. All ways of reducing, minimizing or eliminating the undesirable aspects of these visual obstacles should be explored. Relocation of some lines may be required to permit the most desirable development of some park areas.

2. Road construction which will be required to permit access to and circulation within park areas should be placed on the land in such a manner as to result in a minimum of intrusion, disruption and destruction of existing landscape, vegetation and drainage patterns. Roads should be constructed as parkways - not engineered for the most efficient traffic flow - allowing the visitor a leisurely and pleasurable route on which to travel. Not only is road location important, but the preservation of existing roadside vegetation (trees and shrubs) as well as the enhancement of roadside vegetation by additional plantings is important.

3. The impact of borrow areas used to provide building materials for the construction of the dam should be minimized. To the extent possible borrow areas should be located in areas below the conservation pool level and away from park sites. Park areas should not be gouged for borrow material. Borrow areas above the conservation pool should be properly graded, covered with topsoil, seeded, and landscaped. No open borrow areas should remain after the completion of construction.

4. There may be areas near the shoreline which for reasons of its scenic qualities of topography, geology, or vegetation should be preserved in an essentially unaltered state. To insure the preservation and guard against encroachment by private landowners, scenic easements or purchase of these areas is recommended. These possibilities should be examined in the master planning stage of the project.

XI. Costs

Information in this section to be determined by appropriate
Corps staff sections.

XII. Graphic Presentation

Site Descriptions

Tennessee Colony Locks (Plate 1)

Virtually 100% forested, the land is mostly in the Trinity River flood plain but with a bluff giving some relief at the south-west end of the site. It will command a close view of the dam from both upstream and downstream sides. There are no existing roads providing access or an interior road net however it is anticipated that there will be a roadway across the dam itself, which will provide the necessary access.

Rocky Branch (Plate 1)

This area, functionally related to the Tennessee Colony Locks site, has the desirable feature of minimum flood plain along almost all of its lengthy shoreline. The land is rolling and at least 80% forested with elevations of over 100 feet above the conservation pool level. There is no road access presently and only one dirt interior road.

Big Brown Creek (Plate 1)

Low, mostly wooded land which abuts the Big Brown Lake Dam on the south side. On the opposite side (north) of the dam, a large power generating plant is being completed.

Bear Creek (Plate 2)

Flat land and largely forested, this area has an excellent vantage point to the main body of the lake as well as more sheltered access on Bear Creek. Road access is poor with only one dirt road leading into the site. There are no other roads within the site. This area has good ratio to shoreline area.

Amerada Camp (Plate 2)

Amerada Camp is rolling land currently pastured with scattered trees (forested on the bottoms). Extensive shoreline with several inlets and drowned creeks, which could provide good areas for boat launch or marinas. The lake view will be very good as the land rises quickly from the shoreline. Road access to the south end is fair (paved most of the way but dirt for about 1 1/2 to 2 miles). Present road to the central and north portions will be cut off by the lake making them presently inaccessible.

Cottonwood Creek (Plate 3)

This site is completely forested and gently sloping. Access is good via farm to market road 488, however only one interior road exists. The Cottonwood Creek arm gives this site a great deal of shoreline.

Tehuacana Peninsula (Plate 4)

Tehuacana Peninsula consists of a small peninsula located in the lower-central part of the main body of the lake. Connected to the mainland by a larger peninsula formed by Richland and Tehuacana Creeks. This site will have a dramatic view of the lake as it is surrounded almost entirely by the water. The land is partially forested and partially in pasture and is gently rolling. Road access promises to be excellent with farm-to-market roads 416 and 488 from the west and south respectively intersecting at the site. FM 488 extends north about 2 miles and then intersects U.S. 287 coming from the northwest.

Chambers (Plate 4)

The primary attractiveness of the Chambers site is it is the first public access point for visitors coming from the north via interstate 45 and leaving the freeway at Corsicana on US 287. The site contains small wooded areas but is mostly pasture land with widely scattered trees. The land rises slowly from the shoreline and beach and swimming areas could probably be developed close to the highway.

Alligator Creek Peninsula (Plate 4)

This is a very narrow peninsula which juts out into otherwise flat bottomland. The land is completely treeless but commands an excellent view of the lake. On the top of the peninsula is US highway 287 and FM 488 where it connects with US 287. This will be a natural observation point for travelers who will be crossing the reservoir on US 287 in either direction. The excellent access suggests that this will be an intensive use area with considerable capital improvement. Some trees should be planted to give screening, shade and definition.

Roundhouse (Plate 4)

This site is long and narrow in shape, being enclosed on the north side by highway 287 and on the south and ends by the Richland Creek arm of the lake. The land is currently cultivated cropland and almost completely devoid of vegetative cover. There is little topographic relief except for a gentle rise along the shoreline leading to the flat upland. Access will be via US highway 287, FM 488, and

Texas highway 309. Heavy silting may occur from Chambers and Richland Creeks, however this may be confined to an area further up the arms.

Yonker Pin Slough (Plate 5)

This site is very flat and about 35% wooded. It can be considered in essentially two parts, lower and upper areas. The lower area is characterized by a minimum of floodplain area making it possible to construct most facilities close to the shoreline. The upper area consists mostly of floodplain with only a very small area above the floodplain. Access to the area is poor with dirt roads most of the way from the community of Rural Shade. Interior roads (2) are dirt and require improvement for public usage.

Rural Shade (Plate 6)

This area is largely treeless and is no more than a low rising hill surrounded on three sides by the main body of the lake and cut off on the fourth side by the flood plain which runs in a narrow strip NW to SE, creating an island of upland. Most of the shoreline is very close to the present Trinity Channel and on the northern shoreline the banks will be very steep. Access is by dirt road from the community of Rural Shade. There are essentially no interior roads except for ranch trails.

Rush Creek (Plate 6)

Rush Creek site is unwooded except for the creek bottoms and part of the flood plain. The topography is moderately sloping along the shoreline but otherwise flat. The present use is crop and pastureland. Access to the site is not available although dirt roads from Rural Shade community approach the site. A ranch trail leads into the area and is the only present method of access for traffic. The shoreline should be protected in several places which would enhance its use for boating.

Goodnight (Plate 7)

This area is moderately undulating with some tree cover (20-25%). It contains an extensive shoreline most of which rise moderately from the water. The Trinity River lies just off the southeast end of the peninsula, that location of which will also provide a good view of the upper portion of the lake. Power lines which cross the area may be a visual detraction. The south and SW sides of the site may offer good access to protected waters. Access is via dirt road from Goodnight which continues partially through the site.

Trinity River (Plate 8)

This site has the most extensive area of moderately to steeply undulating land adjacent to the lake. Additionally, it is almost completely forested with second growth post oak and some bottom land species. The site overlooks the upper reaches of the lake which is fairly narrow and laced with islands, small and large. Access to the southern end is via Texas highway 31 (4 lanes divided) while access to the northern end is via dirt road from Texas 31. There is little underbrush in the forested areas making development cheaper. The only interior road is the northern dirt road which continues to the lake-shore. Along the shoreline, the floodplain is alternately wide and narrow making available a wide assortment of developmental possibilities. Highpoints on the land will make excellent observation areas. Islands should be included in the overall utilization of this site.

Tennessee Colony Headwaters (Plate 8)

This site is beautifully wooded on west side, sparsely wooded in the middle and wooded on the east. There is an extensive floodplain on the north. Highway 274 will service this site.

North Trinidad (Plate 9)

This small site is gently sloping and grassy. It is adjacent to route 274 which should be quite busy. It may command a good view of the ship channel, depending upon the final location.

Trinidad Peninsula (Plate 7)

This site is fairly flat with an extensive flood plain. It is mainly grass and cropland with some trees on the perspective shoreline.

Cedar Creek Dam, East and West (Plate 9)

These sites have a moderately rolling topography throughout most of their area. The vegetative cover is grassland with some forested strips and other trees scattered throughout, giving them a pleasing appearance. The north end of these sites join with the Cedar Creek Dam and on the east, meet a small county park which provides public access to Cedar Creek Reservoir. Access to the south end of the east site is via Texas highway 31 and to the north end via a newly constructed farm to market road. The southeast corner of the west park will be close to the city limits of Malakoff.

Walnut Creek (Plate 10)

This is a small site, about 50% wooded which marks the entrance to the Cedar Creek arm of the lake. There is a slight rise or roll to the land for relief. A feature of this site is a levee which will rise above the conservation pool level. This levee surrounds the south and west shore creating a strip of water between it and the shore. From the southwest corner, the levee runs westward across the lake to the south end of the Trinidad peninsula. This area has a very good view of the lake. Access is by dirt road connected to FM 90.

Turkey Creek Point (Plate 10)

From this site there is an excellent view of the main upper part of the lake. The land rises evenly from the shoreline on both sides of the point. The land is about 1/4 wooded, the remainder being grassland with scattered trees and free of underbrush. Access is via paved road from FM 90. This road leads through the center of the area and continues to the point.

Wildcat Creek (Plate 11)

The Wildcat Creek Site is notable for a high rising bluff running its entire length. This bluff allows an excellent view of the lake and produces a minimum of floodplain land. The land is currently pasture land and contains a minimum number of trees. A levee completely protects the north shoreline and is exposed at conservation pool level. The area is accessible via an asphalt road connecting FM 90.

Roustabout Camp (Plate 11)

The area is largely wooded and is gently sloping up from the shoreline. The major appeal of this site is accessibility via U.S. 287. This will be the eastern terminus of the causeway crossing the center of the lake and large numbers can be expected to visit this area. The land is in the middle of the Cayuga oil field and there are many oil and gas fixtures currently in operation. Utilization for recreation purposes will have to be compatible with the operation of the oil field.

A fish hatchery is located on this site and will most probably be maintained when the lake is filled.

Cayuga (Plate 11)

This large area of rolling land has about 50% forest cover, the remainder being mostly grassland. It contains an extensive shoreline as small creeks form arms in several places. U.S. 287 runs along the entire northeast side of the area providing good access. Dirt roads provide some interior access. The view of the lower portion of the lake will be very good.

Bethel (Plate 11)

This large area consists of rolling hills with forests covering about 40% of the area. The site is divided in half by a creek arm. Access is provided by U.S. 287.

Saline Branch (Plate 11)

This site is about 35% forested and 65% grassland. There is a moderate rise in the land from the shoreline. The grassland contains scattered trees and there is a good view of the lake. Access is via asphalt road from U.S. 287. A ranch house at the end of this road may be in the flood plain and require purchase. If purchased, it could be used in conjunction with the recreational facilities developed on the area.

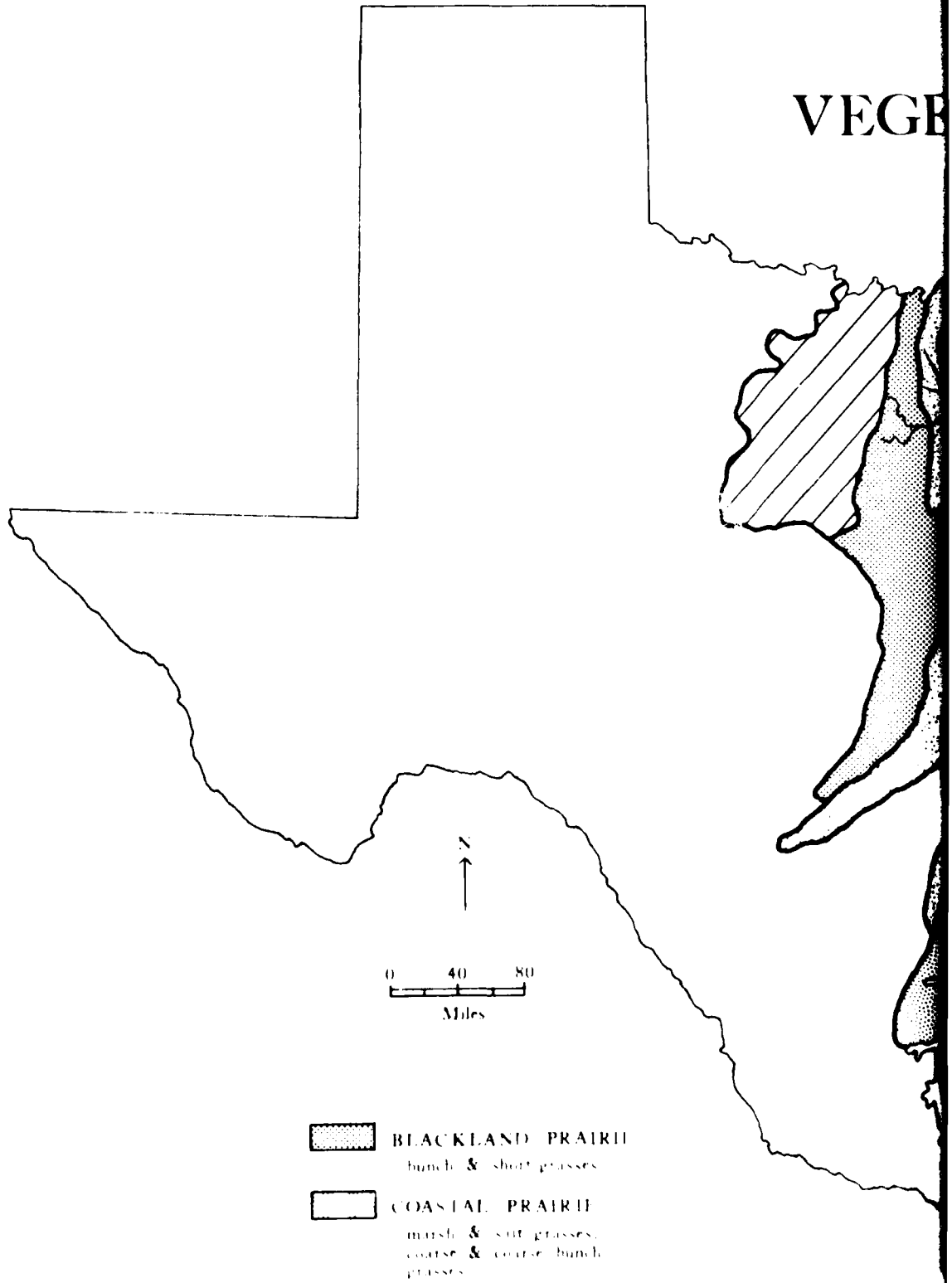
Green's Bluff (Plate 1)

The site is over 80% forested with some sharply rising slopes on the north side. This peninsula juts out prominently into the lower portion of the lake and should provide a sweeping view of the lake and dam to the south and southeast, and the lake to the west and north. The land is gently sloping on the southeast side and somewhat open in its vegetative cover. Access to the site will be via FM 321. On the north shoreline the bottom drops off quickly to about 35 feet.

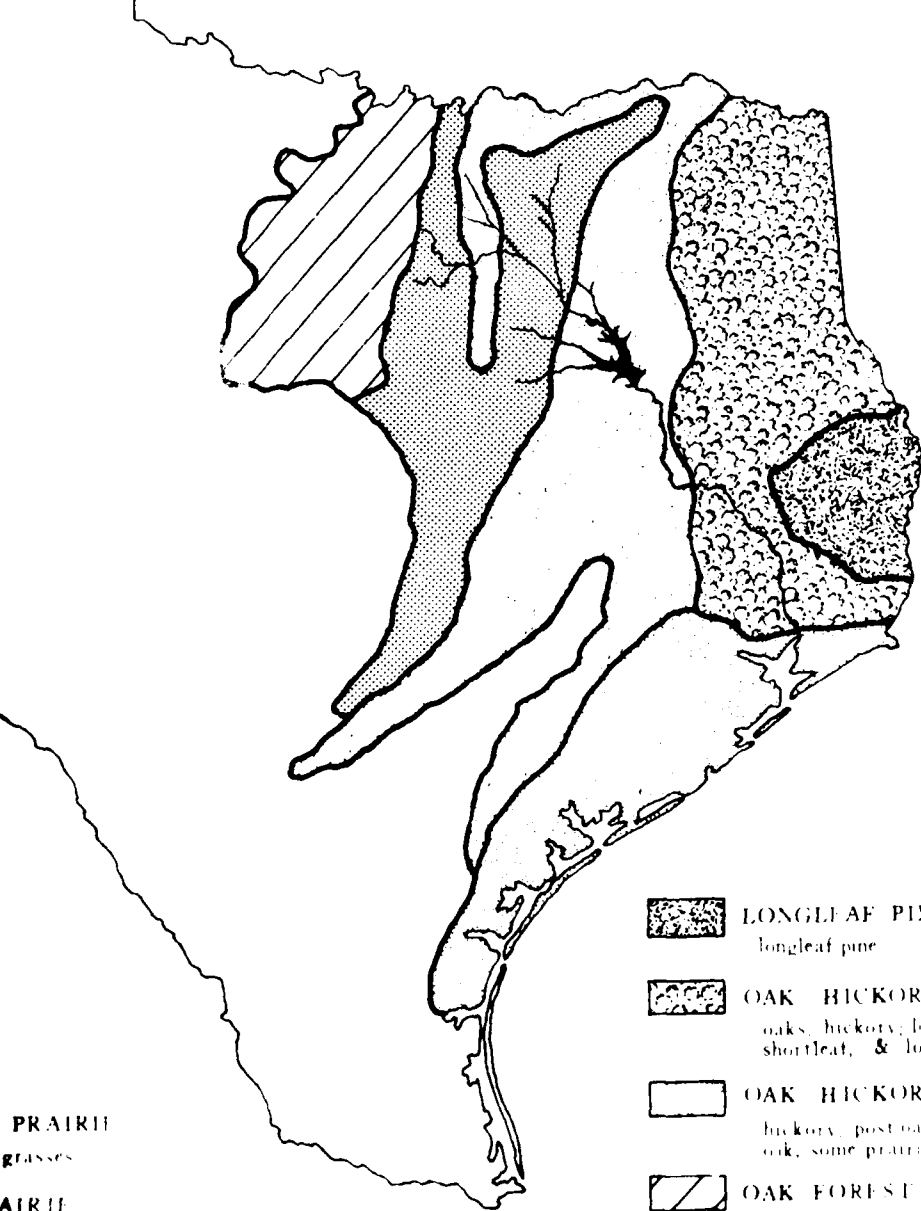
Cook's Corner (Plate 1)

This site is almost flat with much of the area being floodplain. However, there is considerable forest land covering about 50% of the area and nearly all of the shoreline. Access to the area is via FM 321 and FM 2706.

VEGE



VEGETATION REGIONS



LONGLEAF PINE FOREST
longleaf pine



OAK HICKORY PINE FOREST
oaks, hickory, longleaf,
shortleaf, & loblolly pines



OAK HICKORY FOREST
hickory, post oak, black oak
oak, some prairies



OAK FOREST & PRAIRIES
post oak, black oak, some
prairies

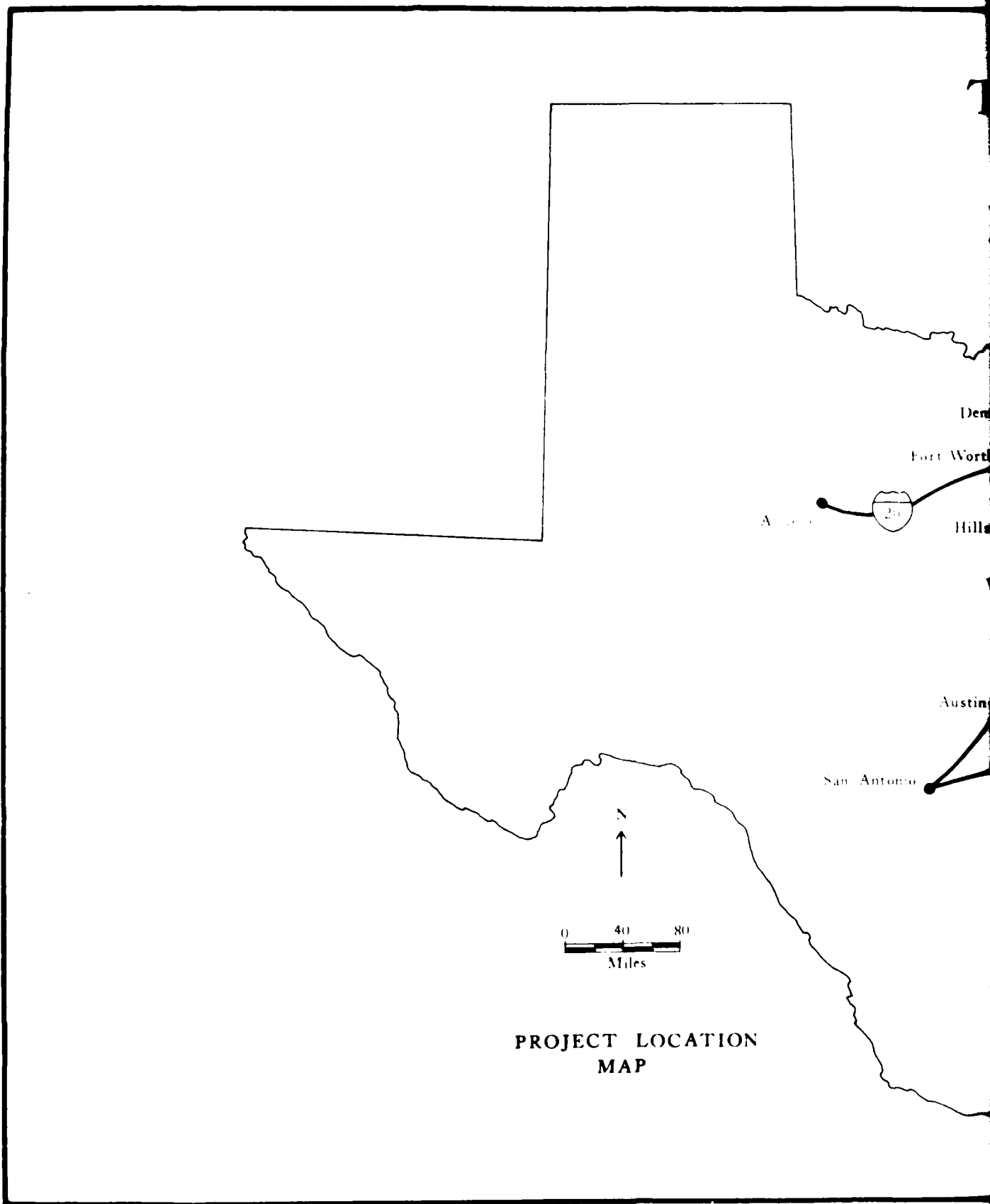
PRAIRIE

grasses

PRAIRIE

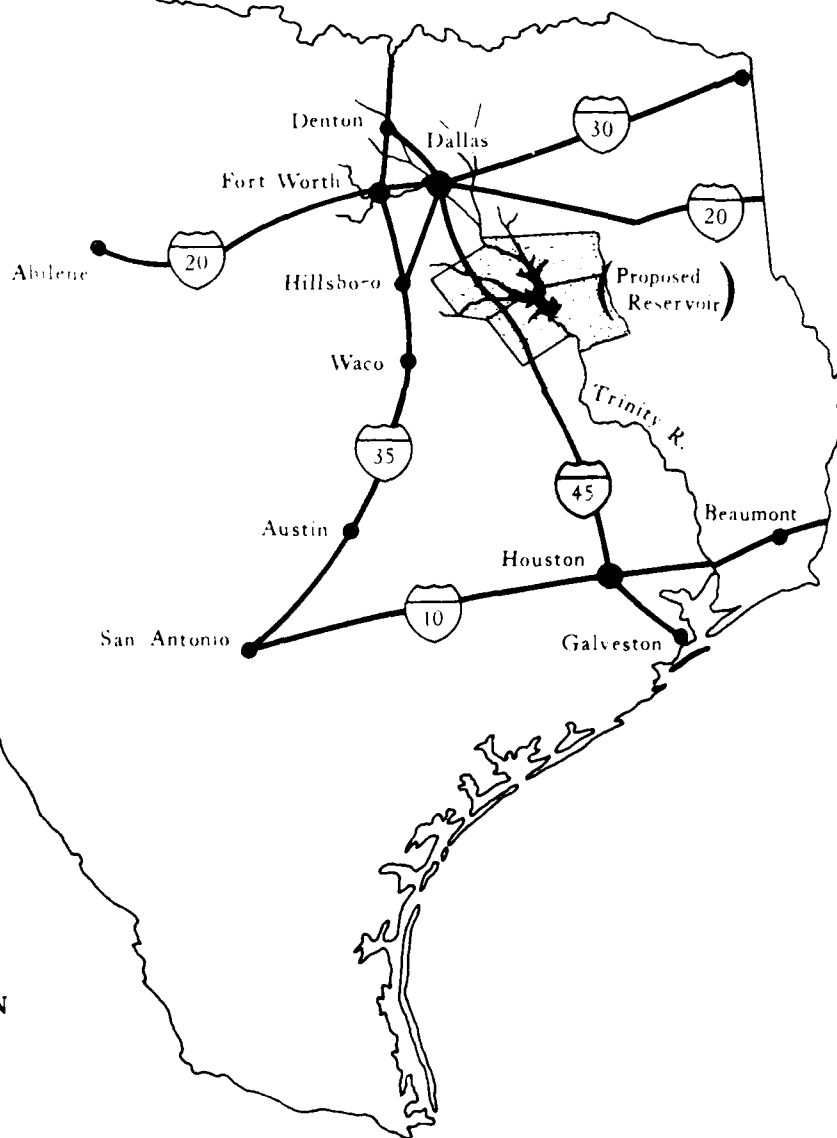
grasses,

some bunch

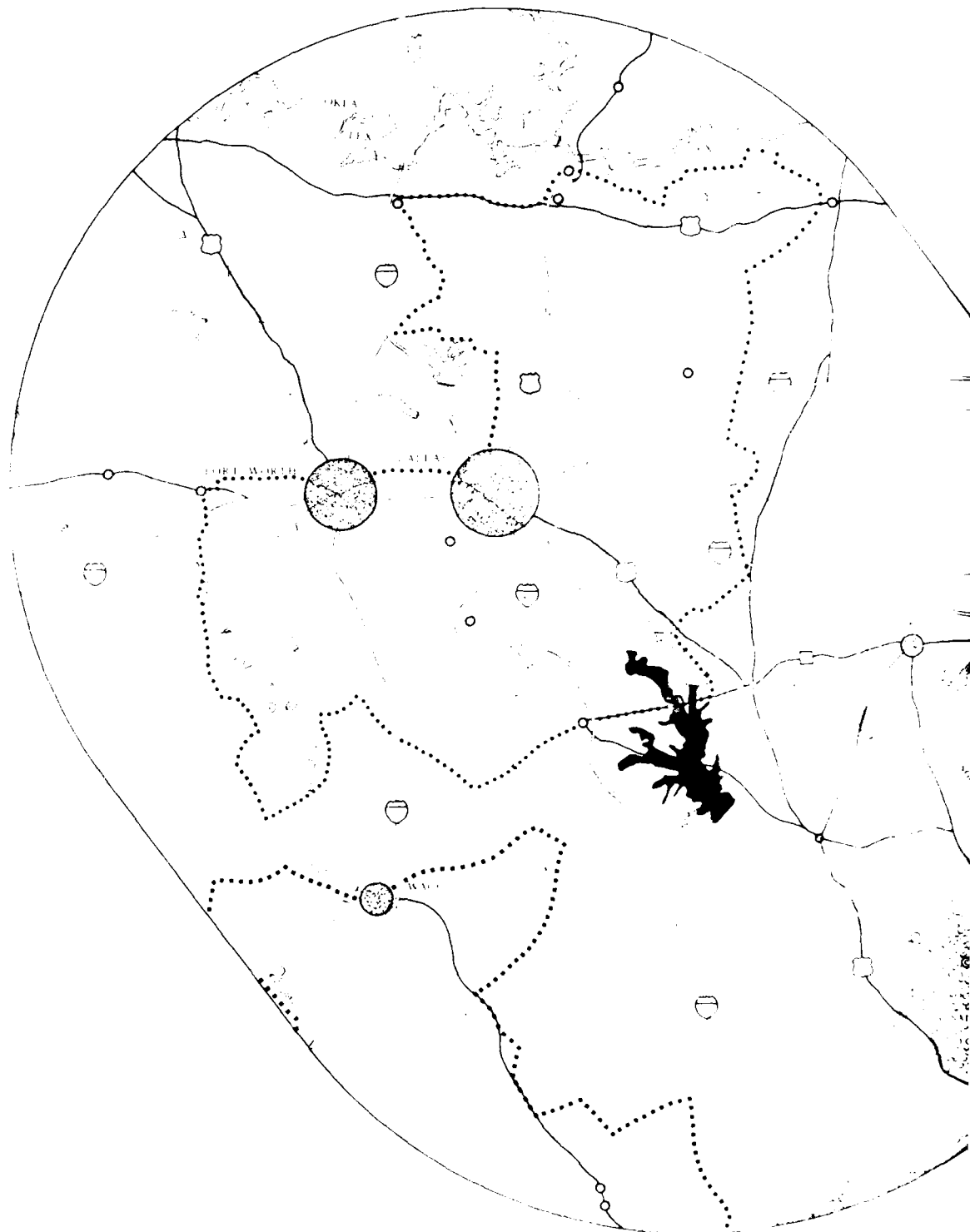


PROJECT LOCATION
MAP

TENNESSEE COLONY RESERVOIR



ATION



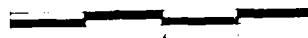
REGIONAL PROXIMITY

AT
M. J. K. V.
OF THE UNIVERSITY OF TEXAS AT AUSTIN



LEGEND

- Interstate
- Major Road
- County Seat
- County Seat
- City
- Town
- Village
- Hamlet



MILES

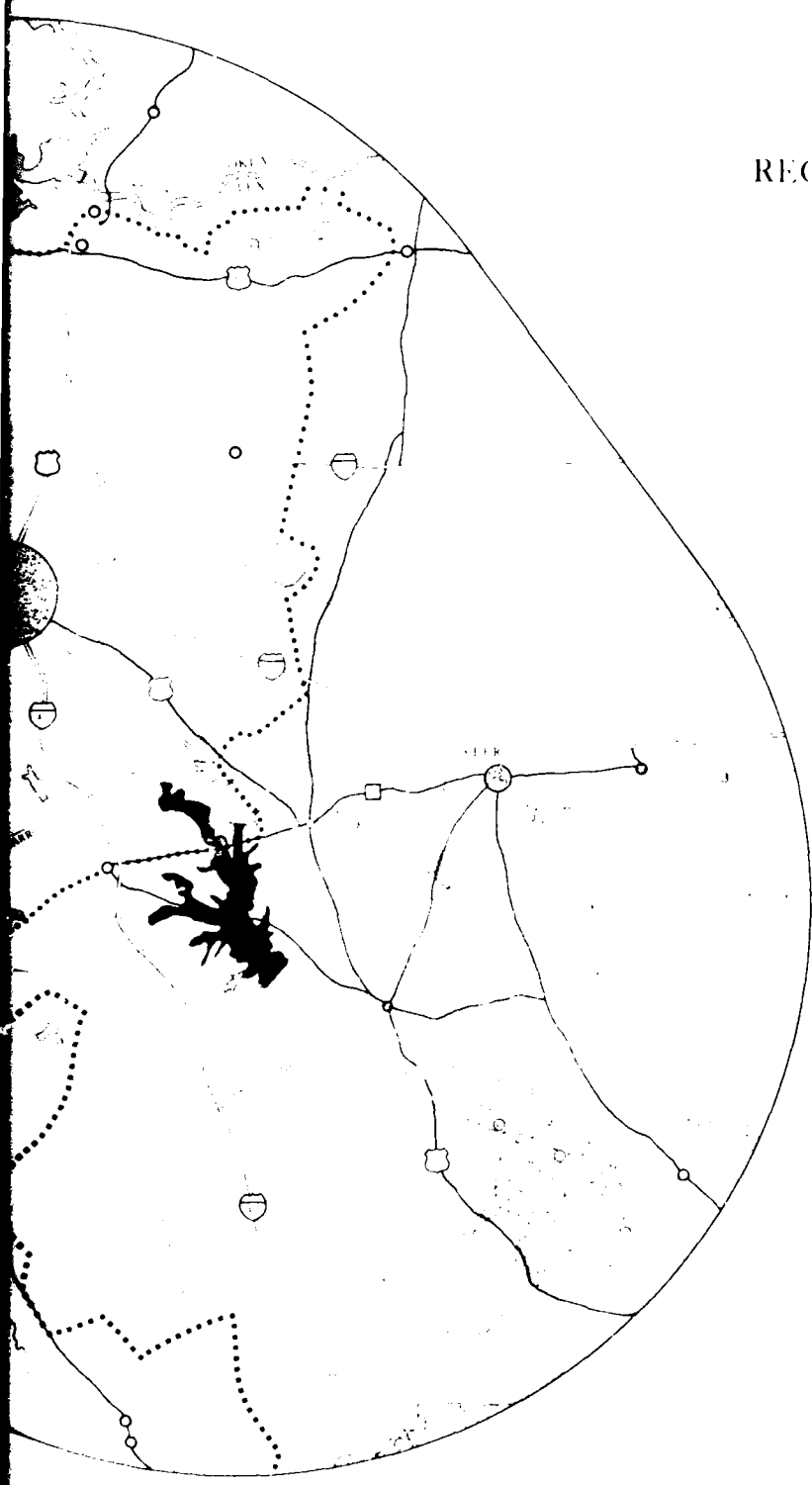
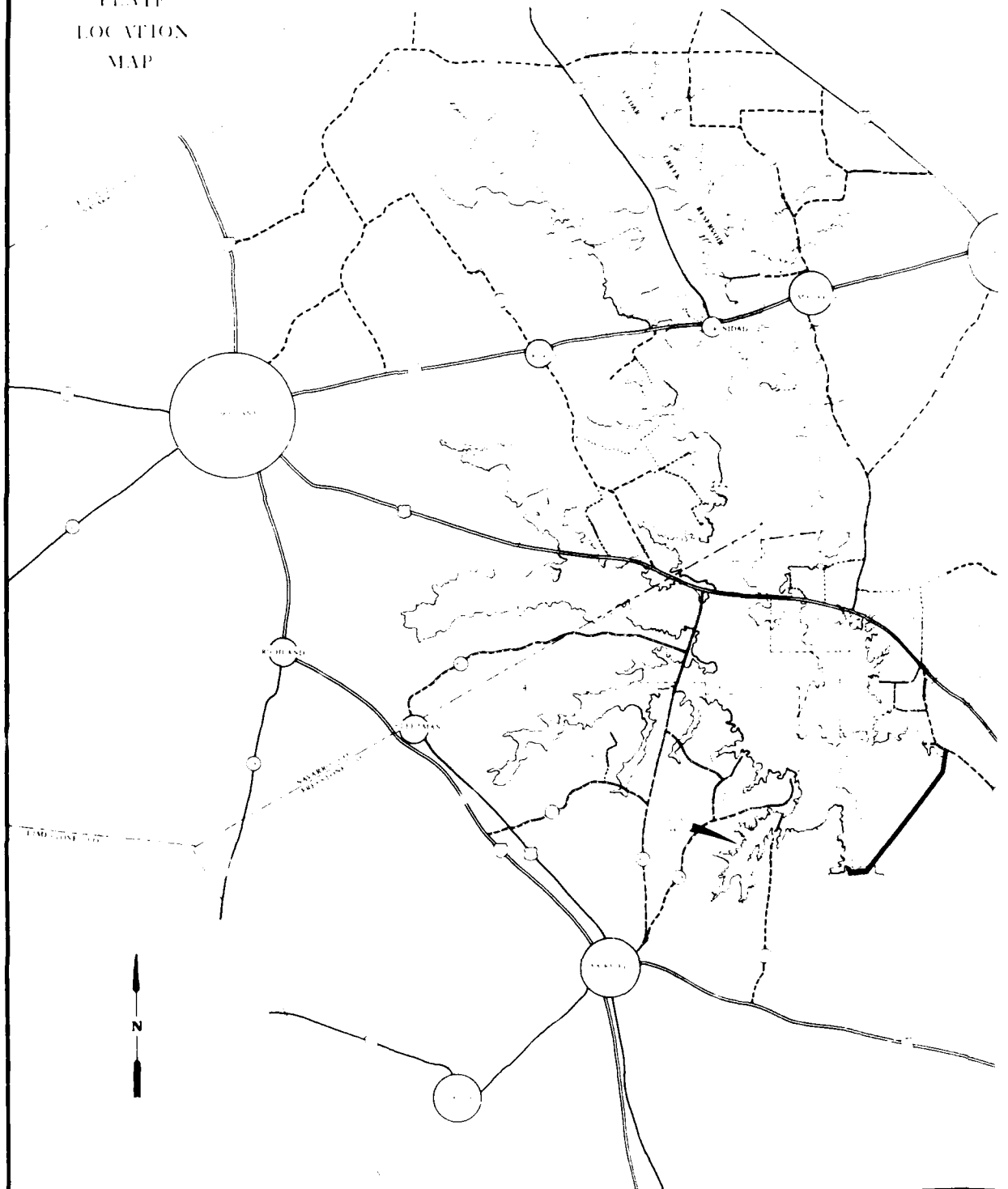
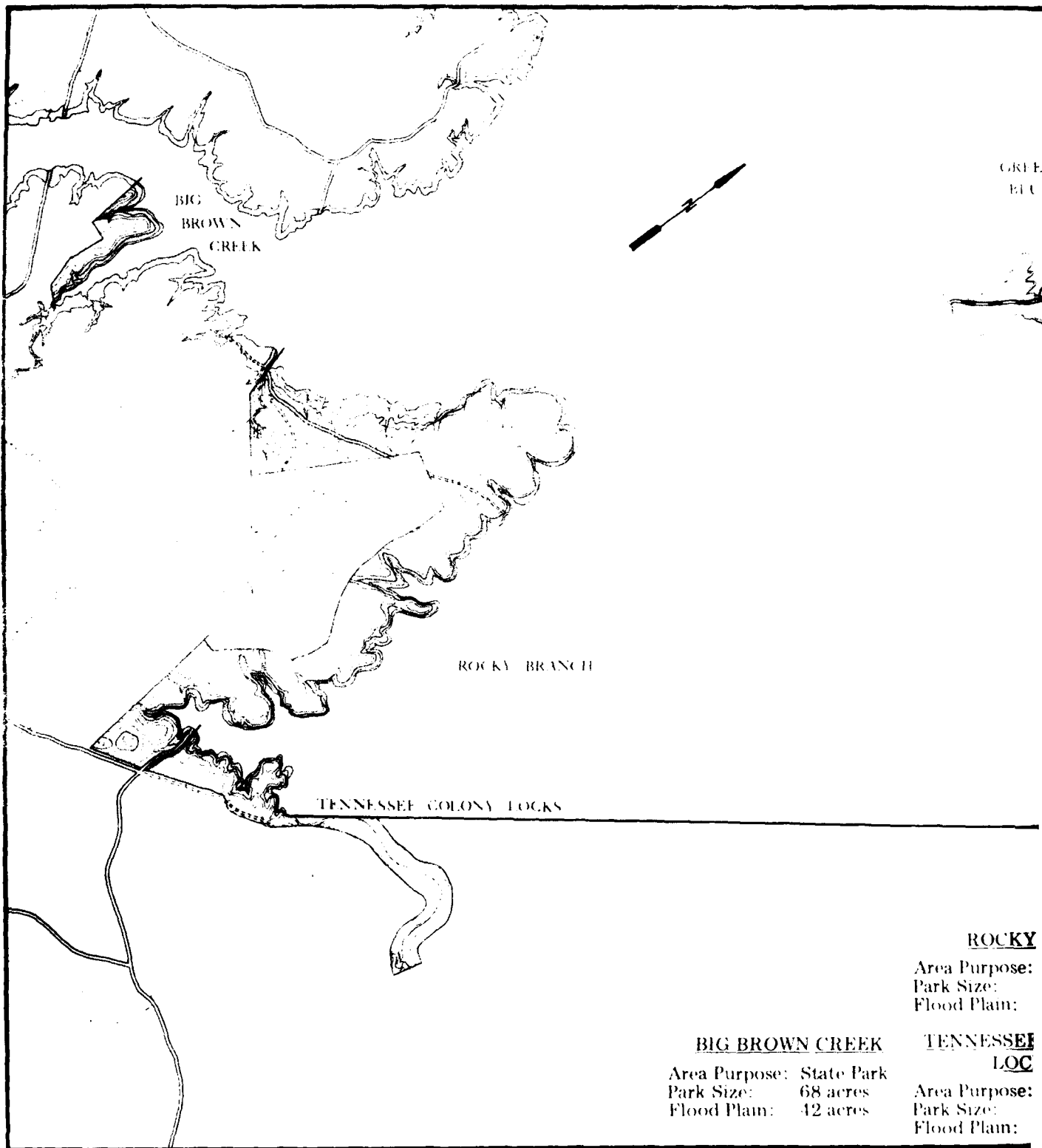


PLATE
LOCATION
MAP







TEXAS A&M UNIVERSITY, RECREATION & PARKS DEPARTMENT

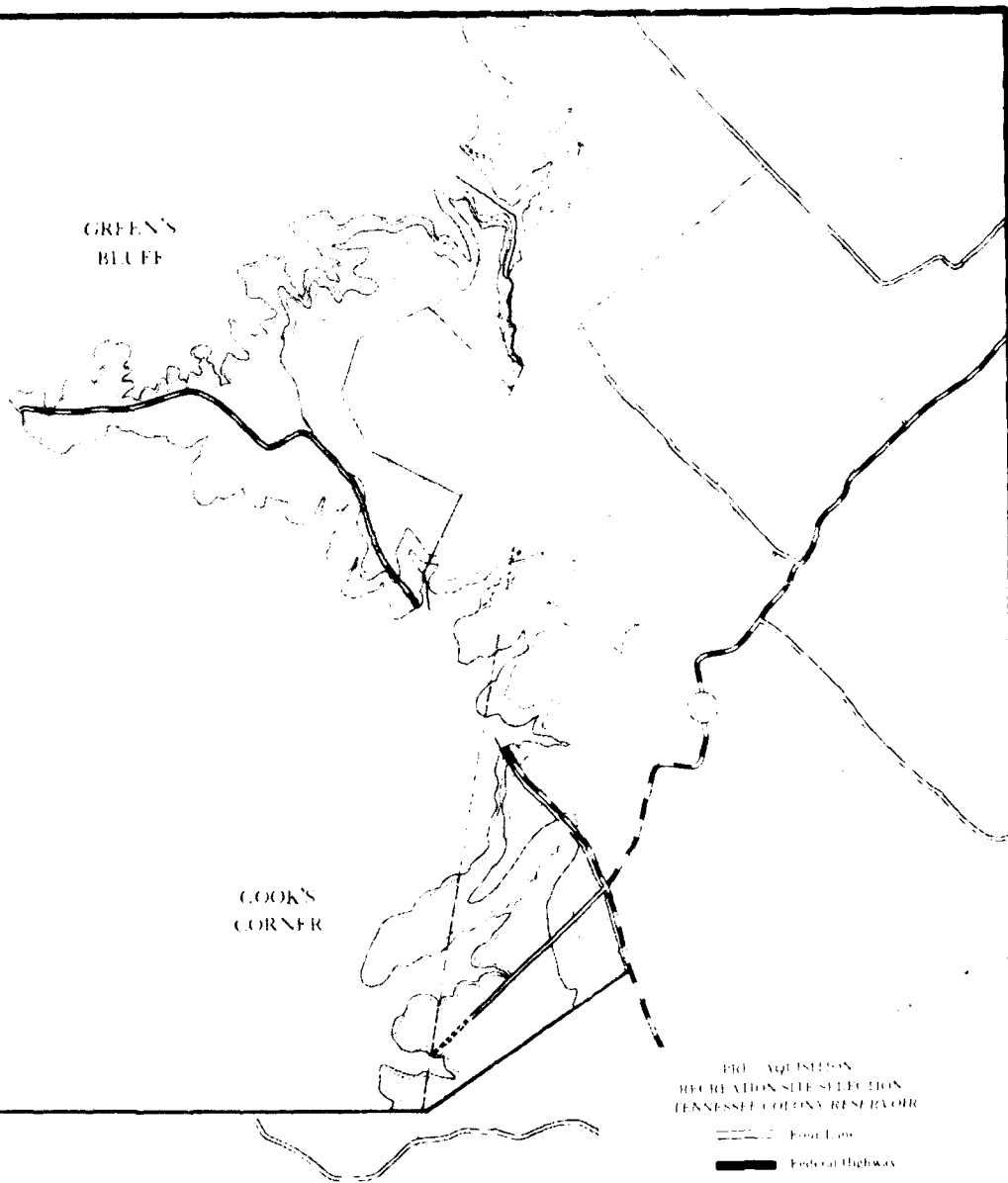


FIG. 1 ACQUISITION
RECREATION SITE SELECTION
TENNESSEE COLONY RESERVOIR

- Four Lane
- Federal Highway
- State Highway
- County Road
- Unimproved Dirt
- Water Body
- Flood Plain
- Park Area

ROCKY BRANCH

Area Purpose: Park Site
Park Size: 1094 acres
Flood Plain: 294 acres

GREEN'S BLUFF

Area Purpose: Park Site
Park Size: 468 acres
Flood Plain: 716 acres

TENNESSEE COLONY
LOCKS

Area Purpose: Park Site
Park Size: 292 acres
Flood Plain: 40 acres









COOK'S CORNER

Area Purpose: Park Site
Park Size: 164 acres
Flood Plain: 493 acres

IG BROWN CREEK

Purpose: State Park
Size: 68 acres
d Plain: 42 acres

PRE-AQUISITION
RECREATION SITE SELECTION
TENNESSEE COLONY RESERVOIR

-  Four Lane
-  Federal Highway
-  State Highway
-  County Road
-  Unimproved Dirt
-  Water Body
-  Flood Plain
-  Park Area

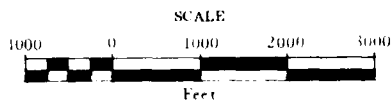
BEAR CREEK

Area Purpose: Group Camp
Camp Size: 342 acres
Flood Plain: 225 acres

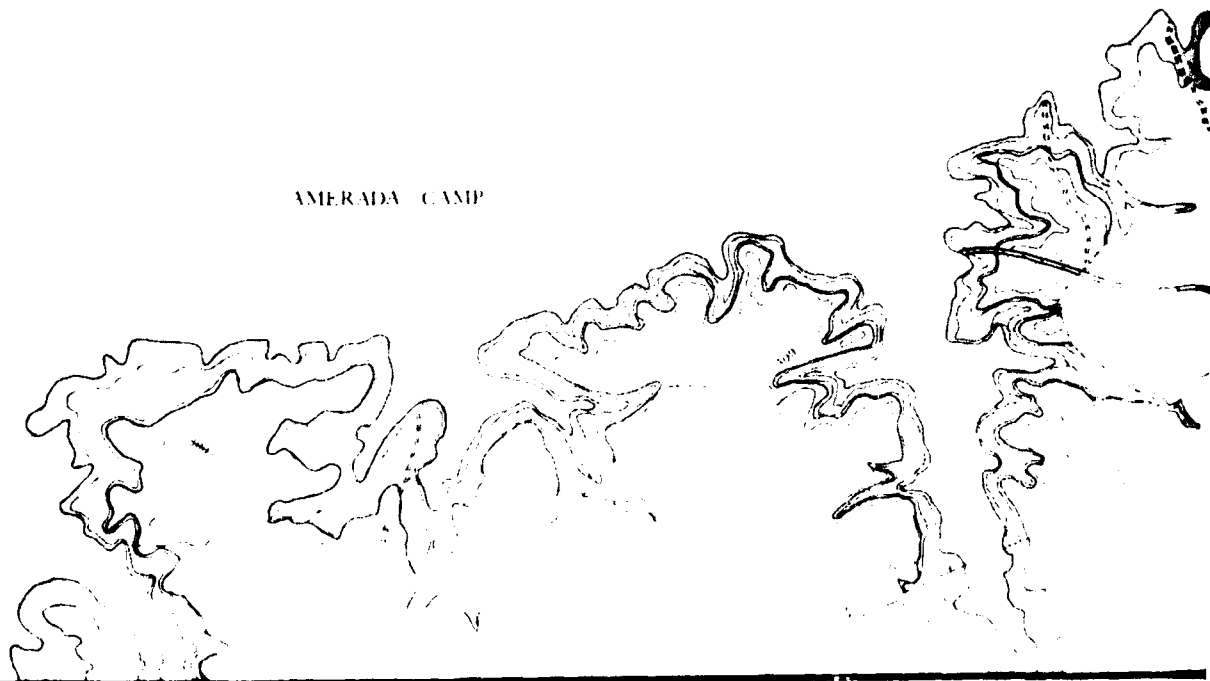
AMERADA CAMP

Area Purpose: Park Site
Park Size: 397 acres
Flood Plain: 149 acres

BEAR CREEK



AMERADA CAMP



BEAR CREEK

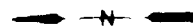
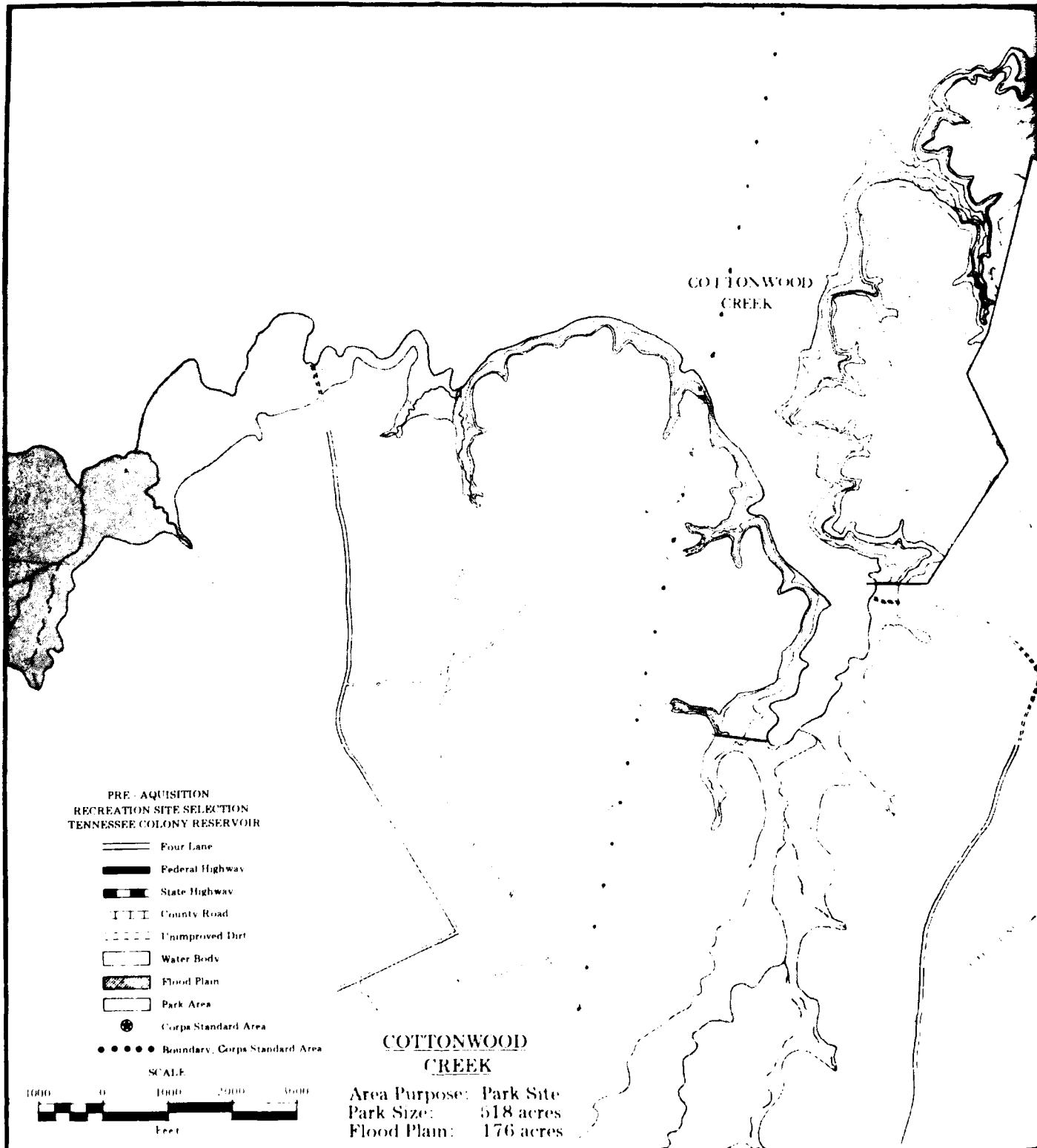


PLATE 2

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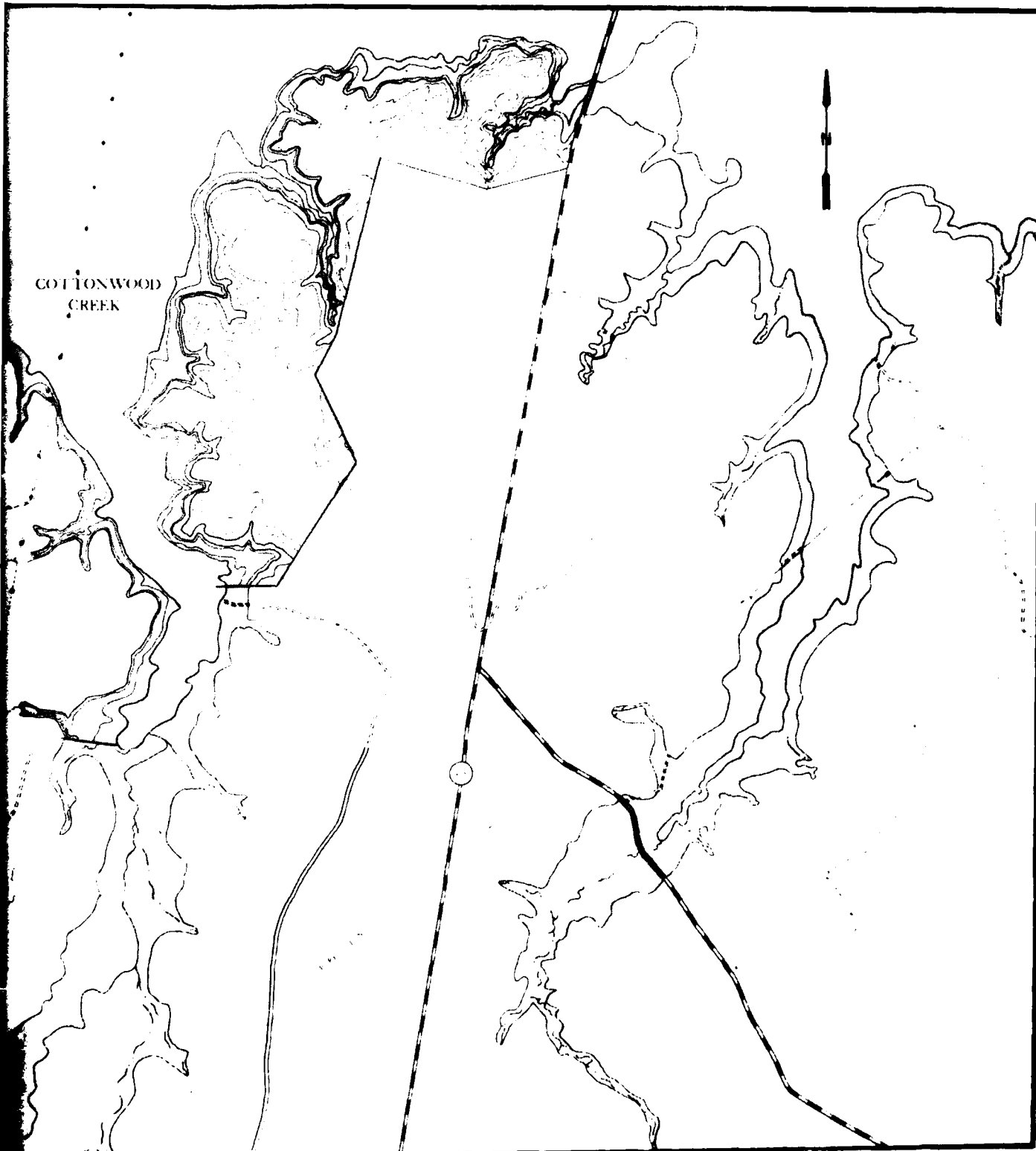
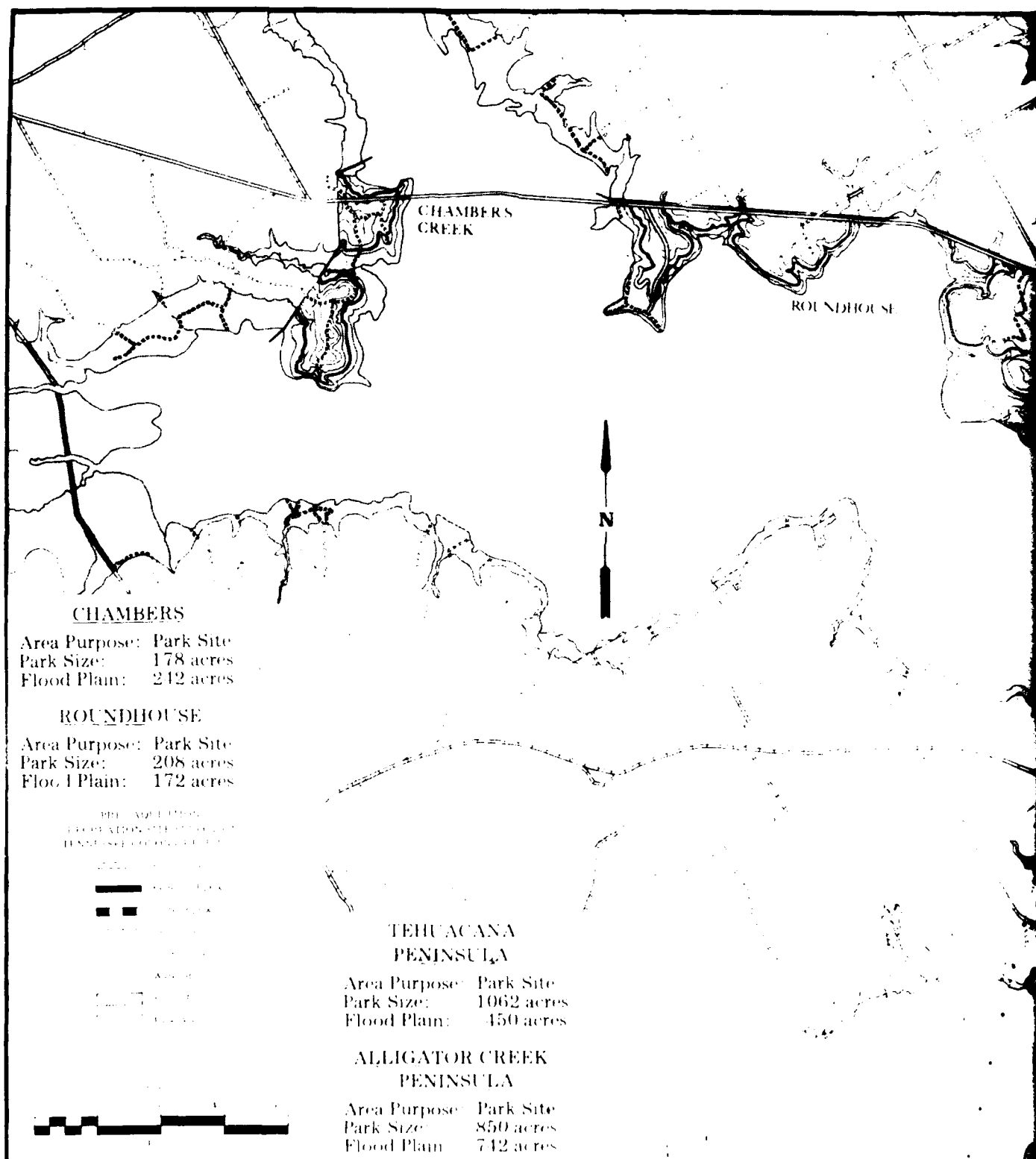
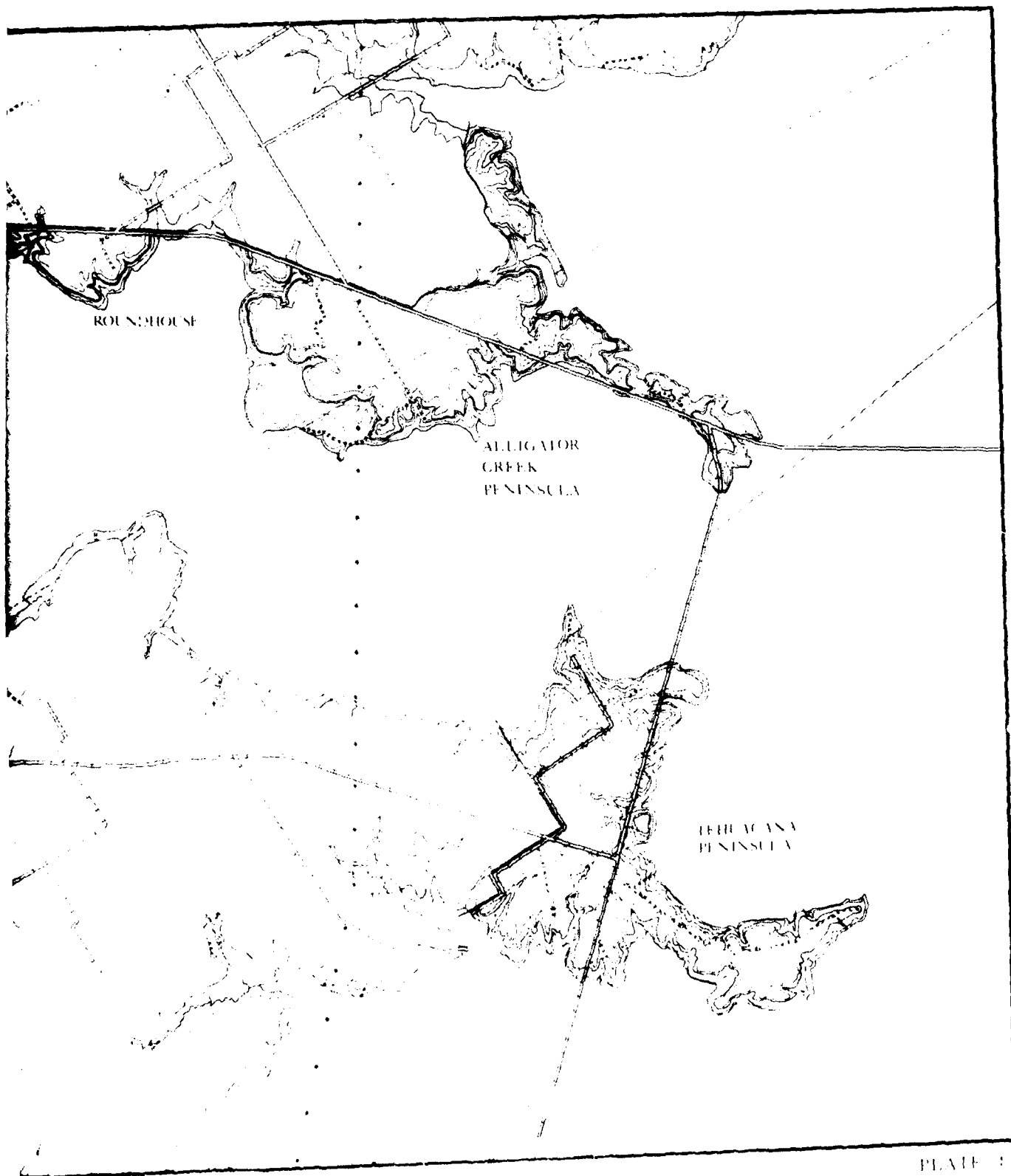
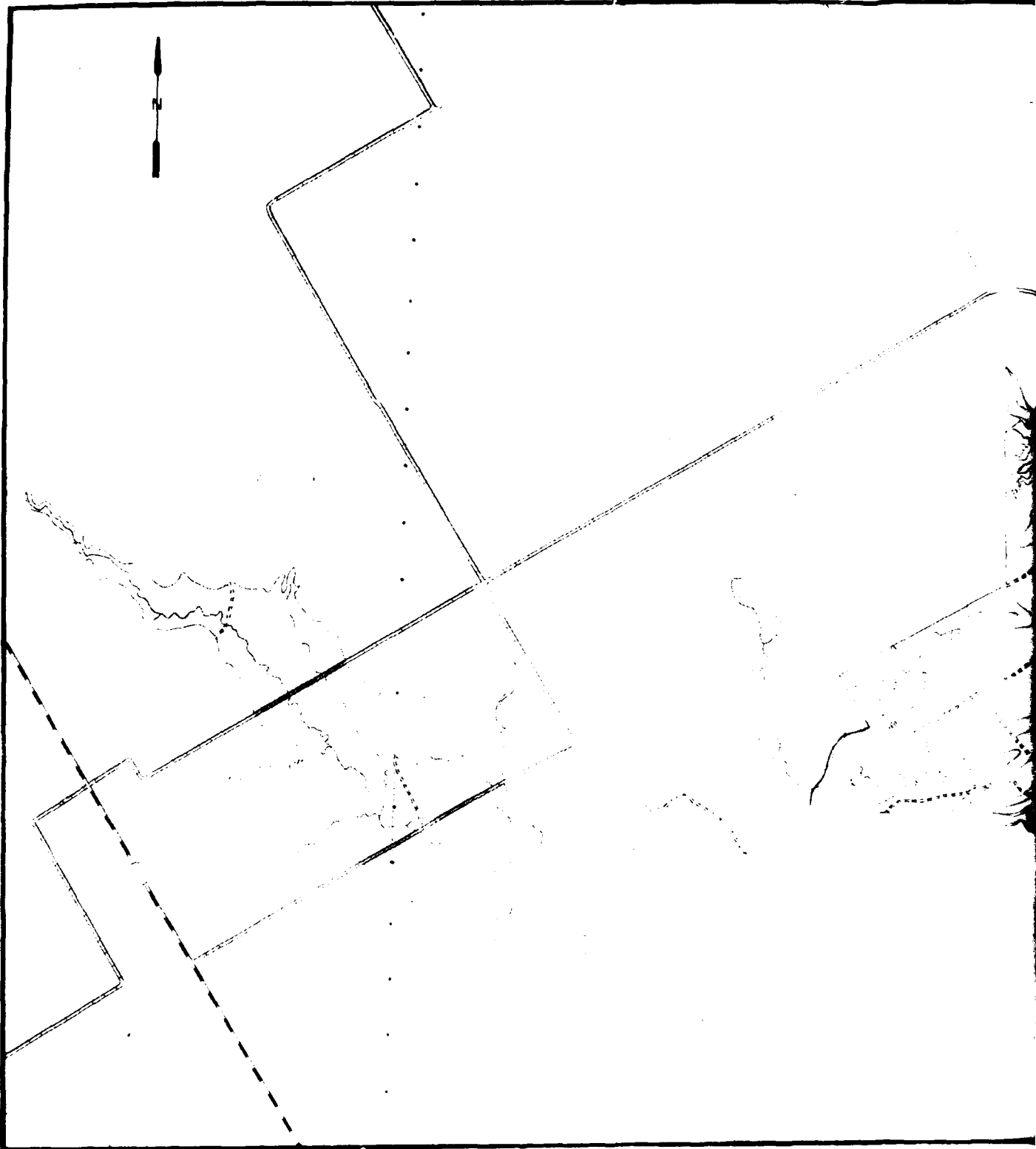


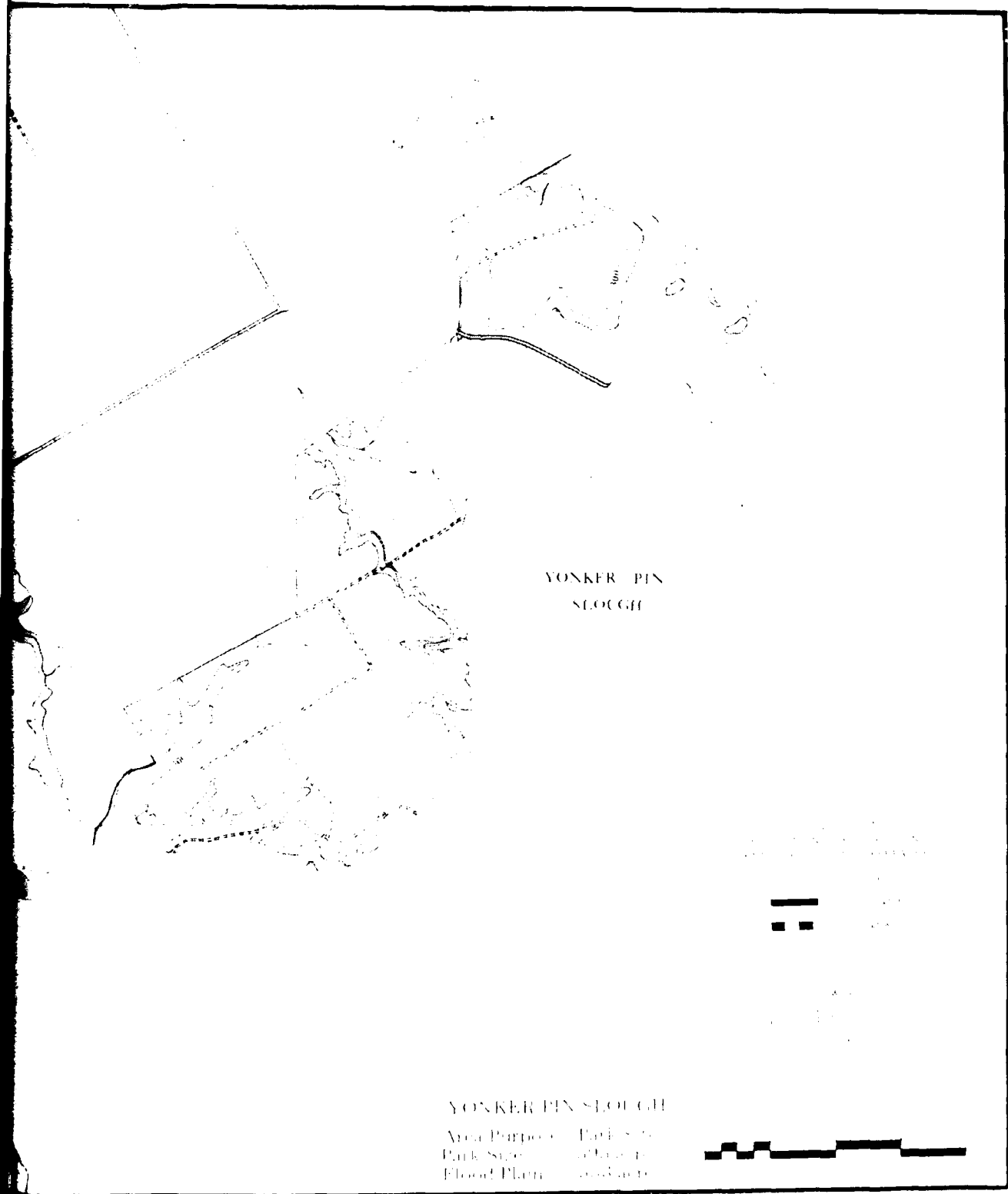
PLATE 3

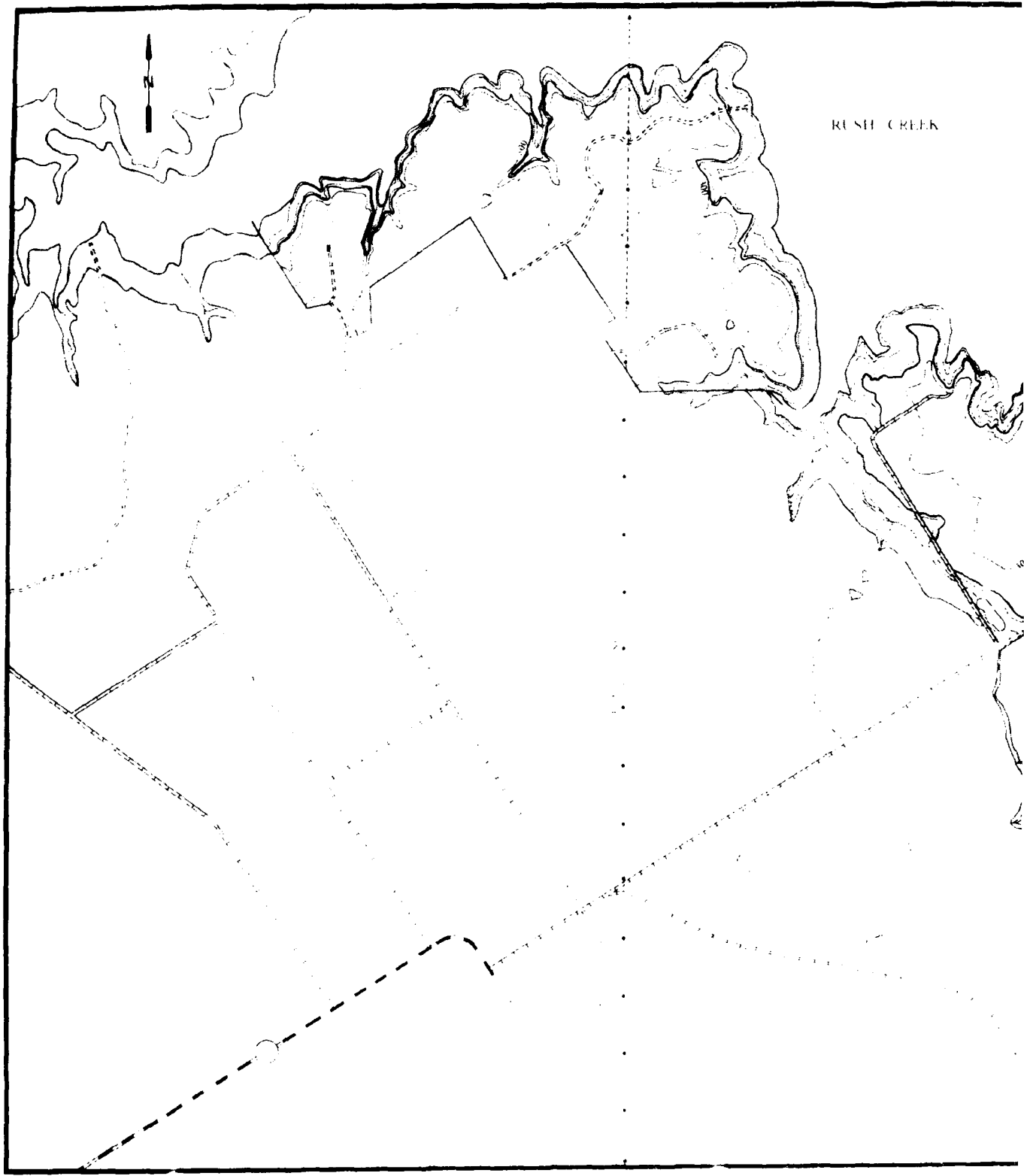






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TEXAS A&M UNIVERSITY, RECREATION & PARKS DEPARTMENT

RUSH CREEK

RURAL SHADE

RUSH CREEK

Area Purpose: Park Site
Park Size: 525 acres
Flood Plain: 143 acres

RURAL SHADE

Area Purpose: Group Camp
Camp Size: 1091 acres
Flood Plain: 550 acres

THE ACQUISITION
OF ALL WATERSHEDS IN
THE STATE OF TEXAS

1. 100' WIDE
2. 50' WIDE



AD-A097 092

TEXAS A AND M UNIV COLLEGE STATION DEPT OF RECREATIO--ETC F/6 13/2
PUBLIC USE LAND REQUIREMENTS, TENNESSEE COLONY LAKE.(U)
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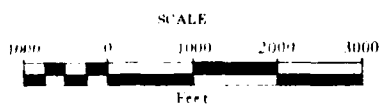
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PRE ACQUISITION
RECREATION SITE SELECTION
TENNESSEE COLONY RESERVOIR

- Four Lane
- Federal Highway
- State Highway
- County Road
- Unimproved Dirt
- Water Body
- Flood Plain
- Park Area

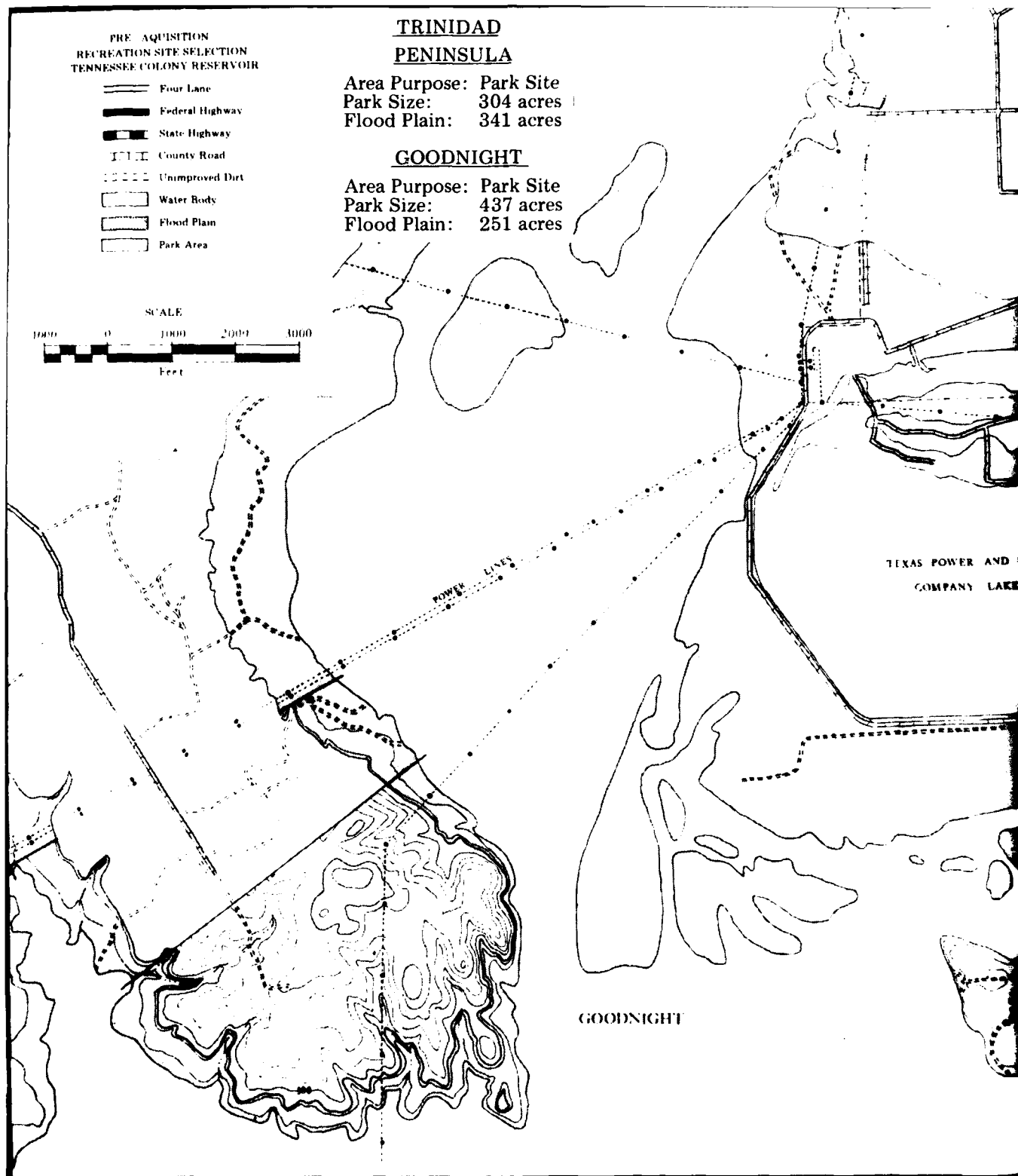


TRINIDAD
PENINSULA

Area Purpose: Park Site
Park Size: 304 acres
Flood Plain: 341 acres

GOODNIGHT

Area Purpose: Park Site
Park Size: 437 acres
Flood Plain: 251 acres



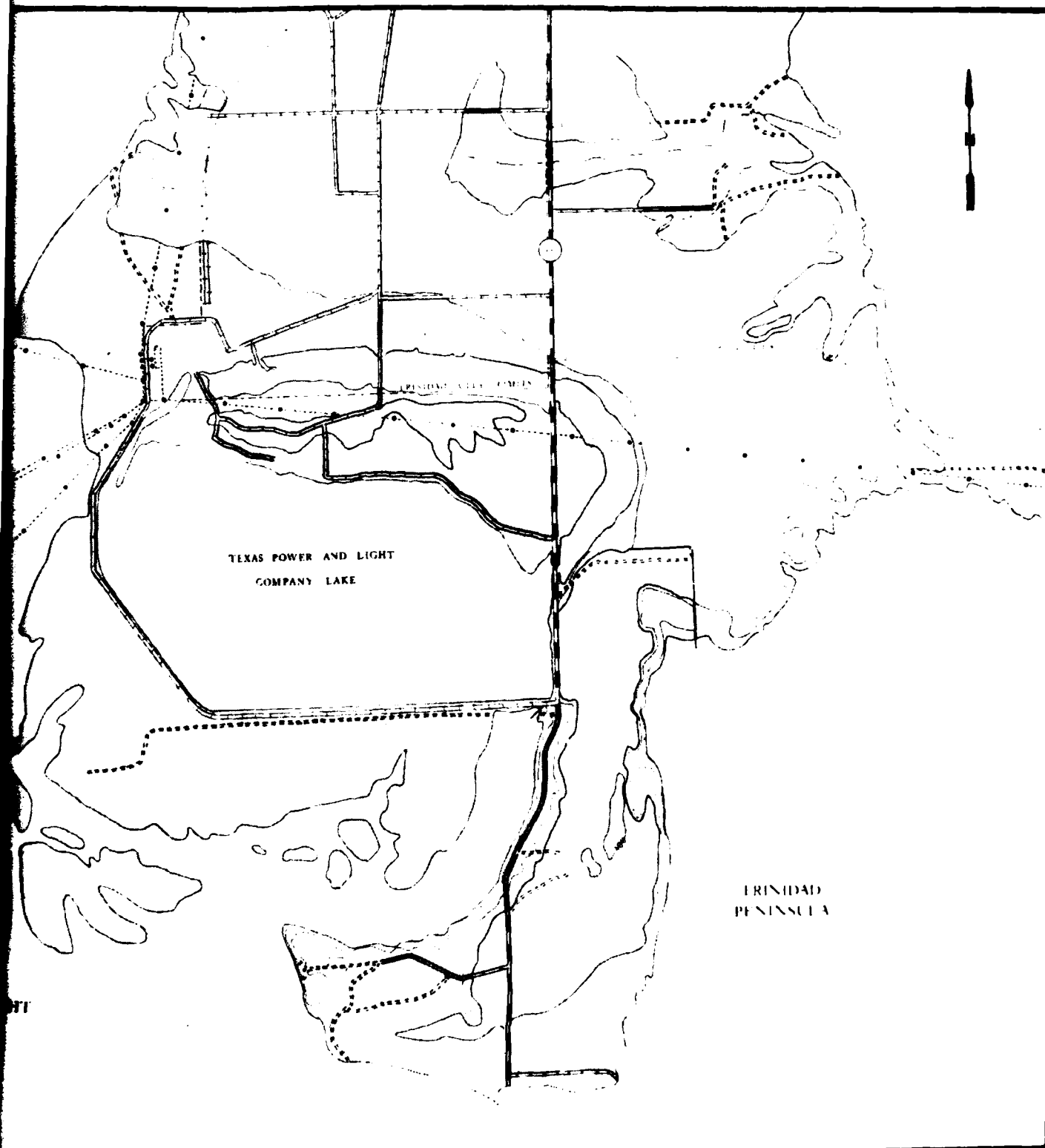
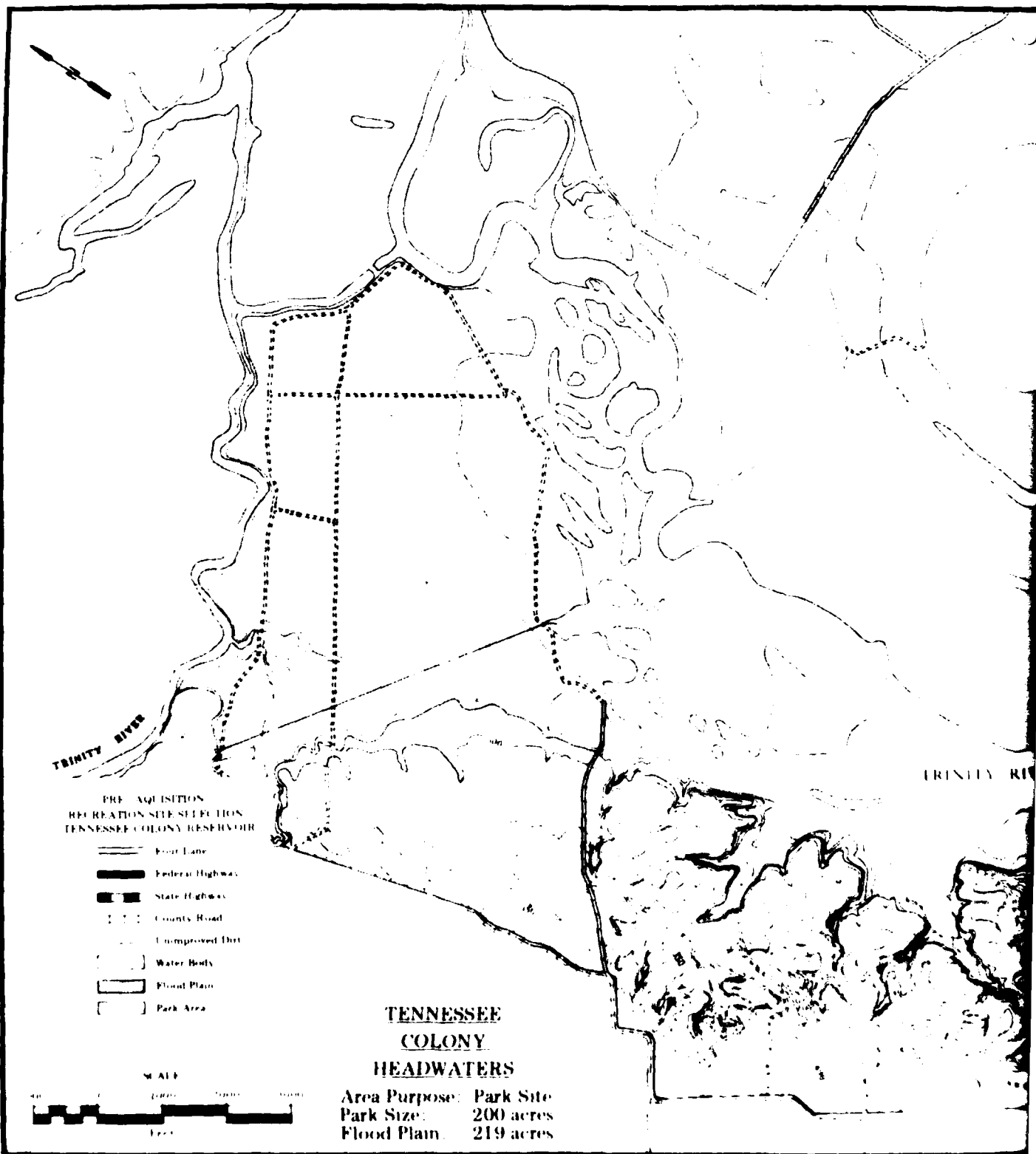
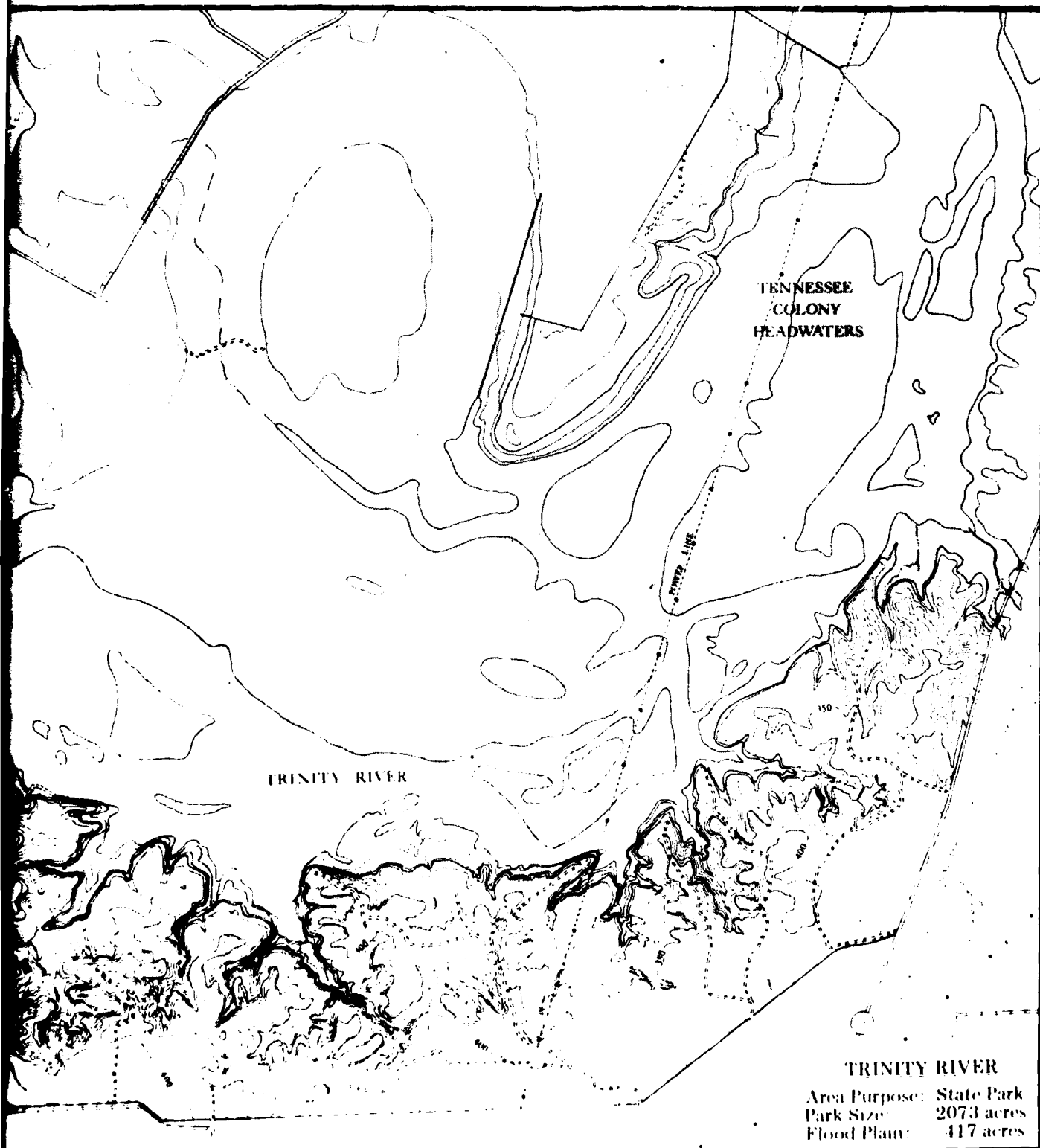
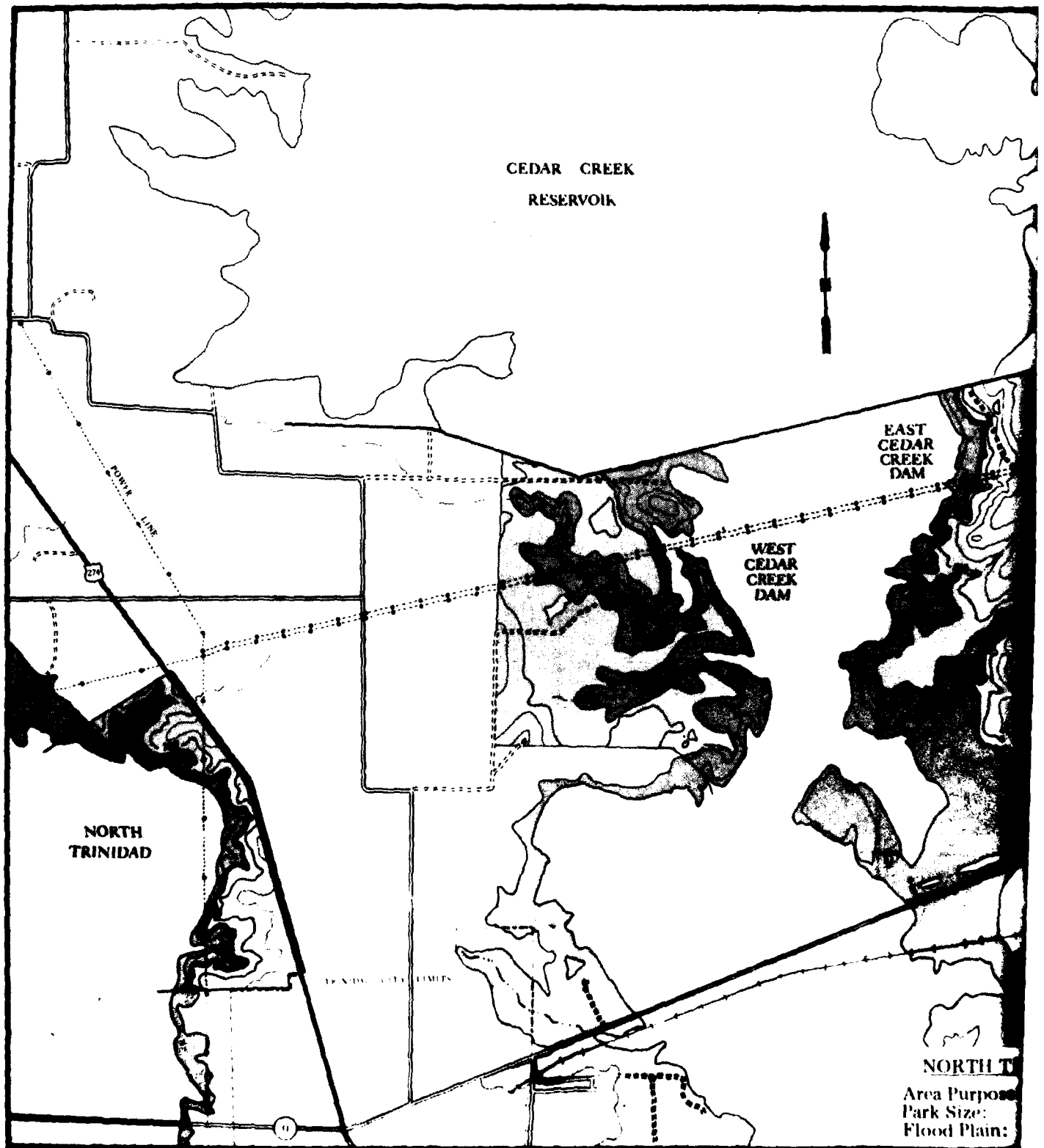


PLATE 7

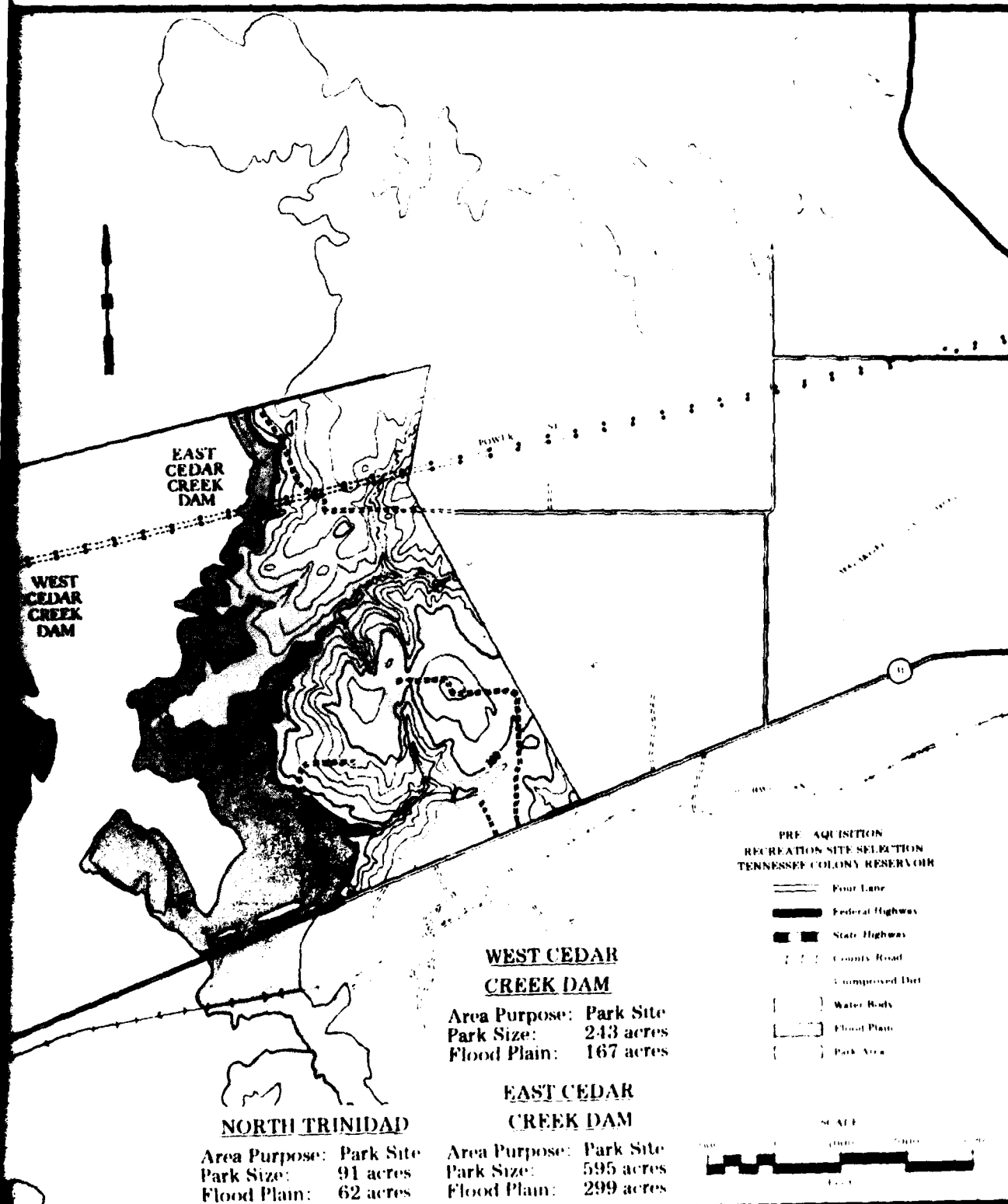


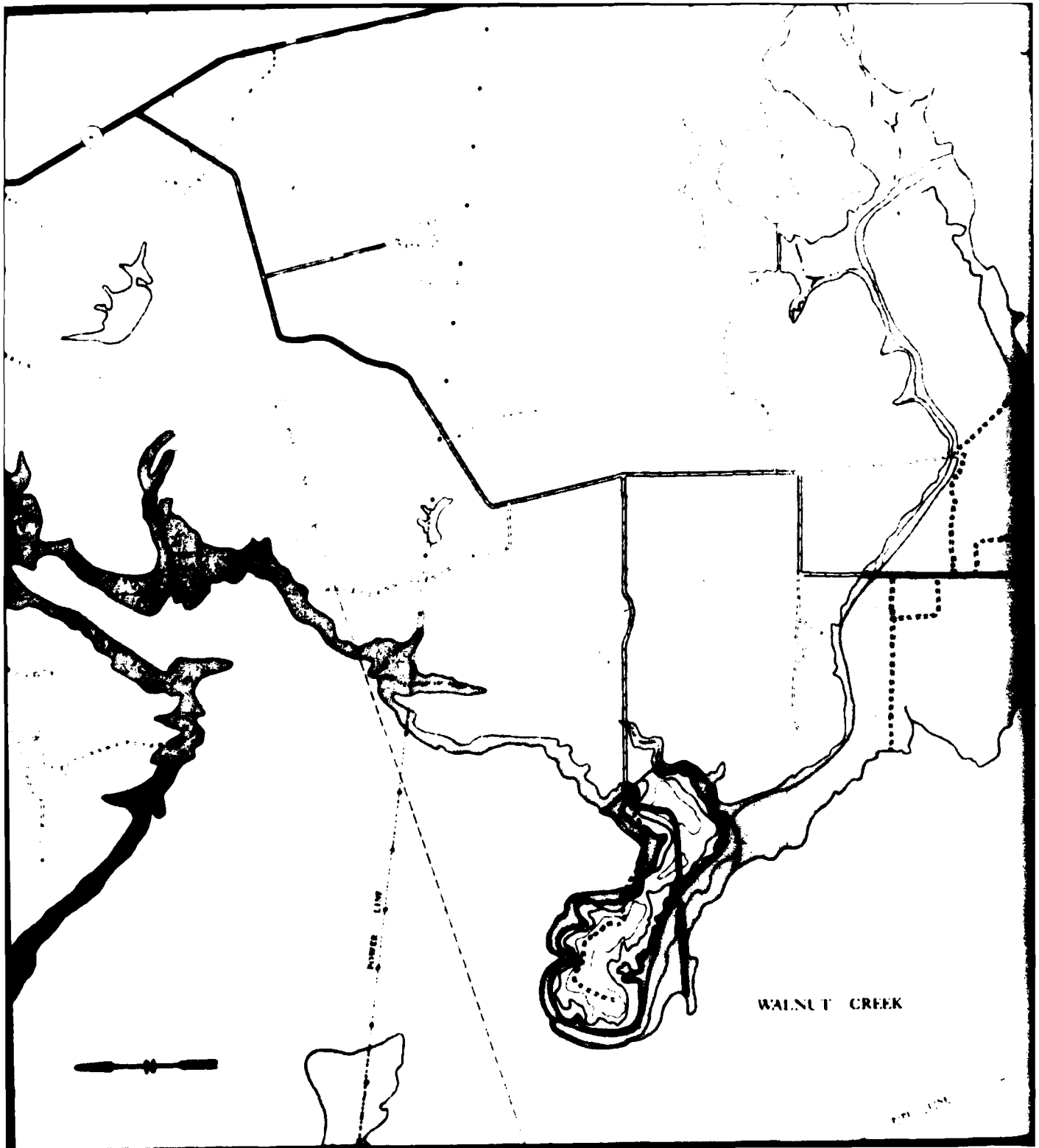
TEXAS A&M UNIVERSITY, RECREATION & PARKS DEPARTMENT

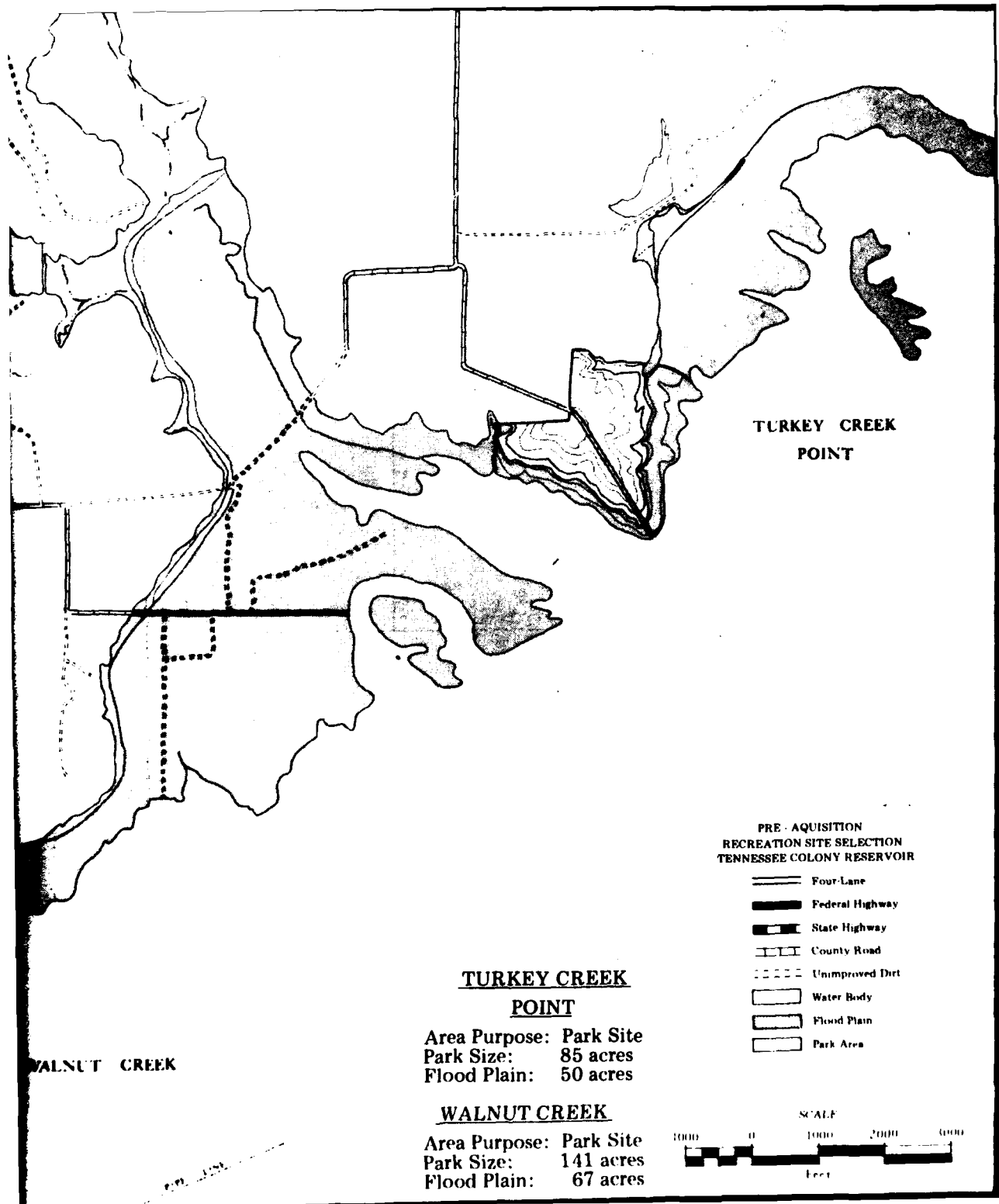


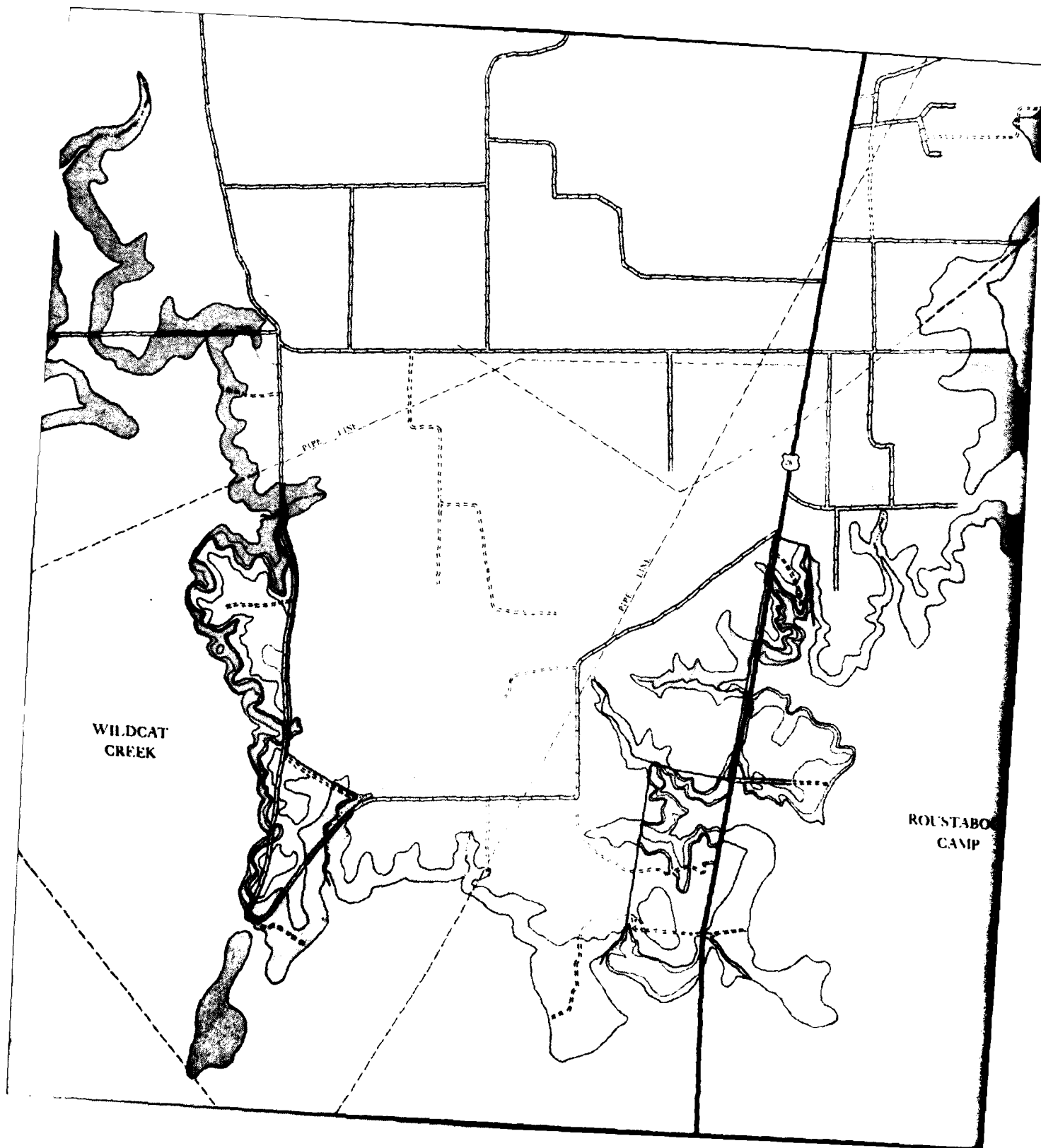


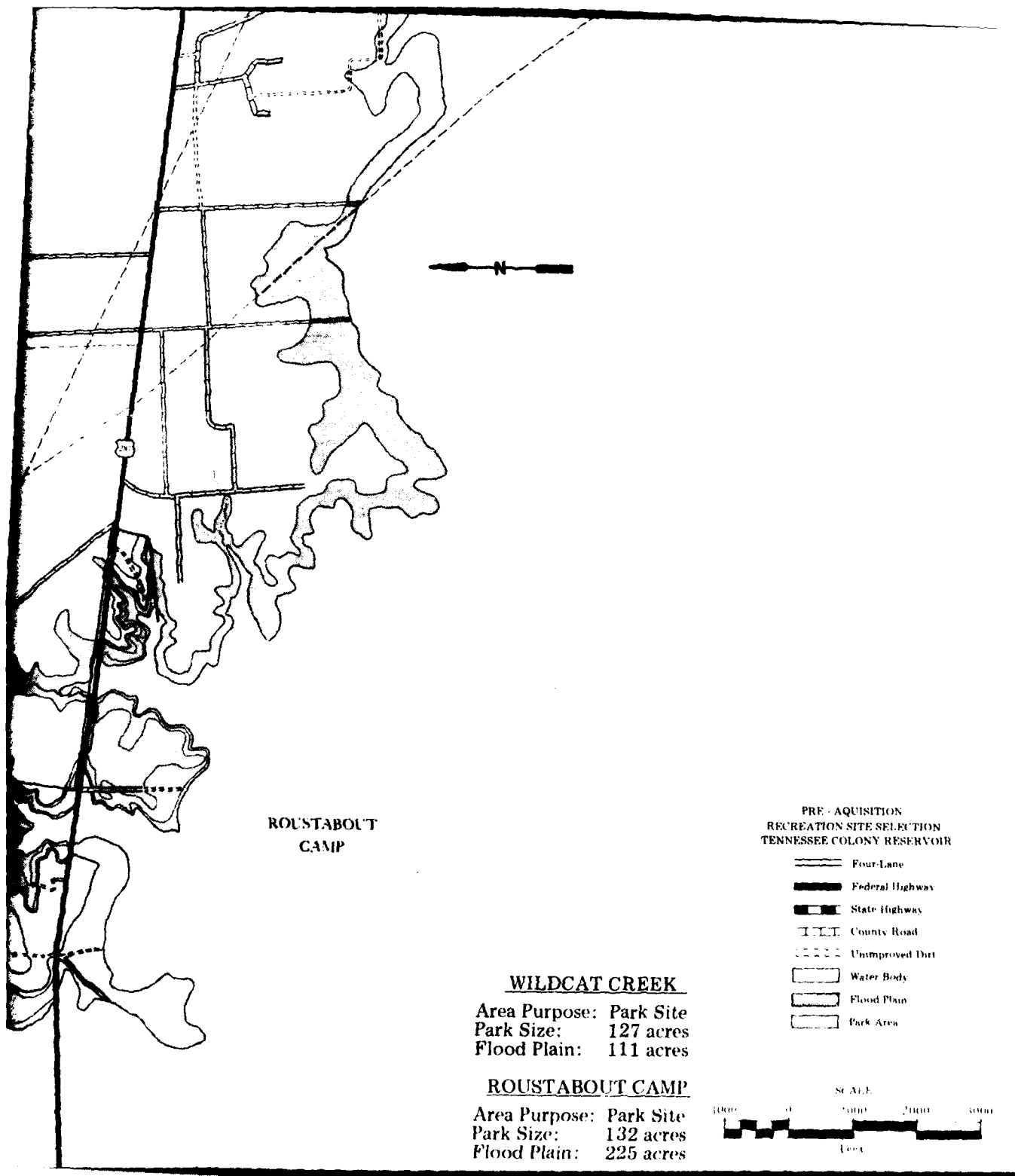
TEXAS A&M UNIVERSITY, RECREATION & PARKS DEPARTMENT

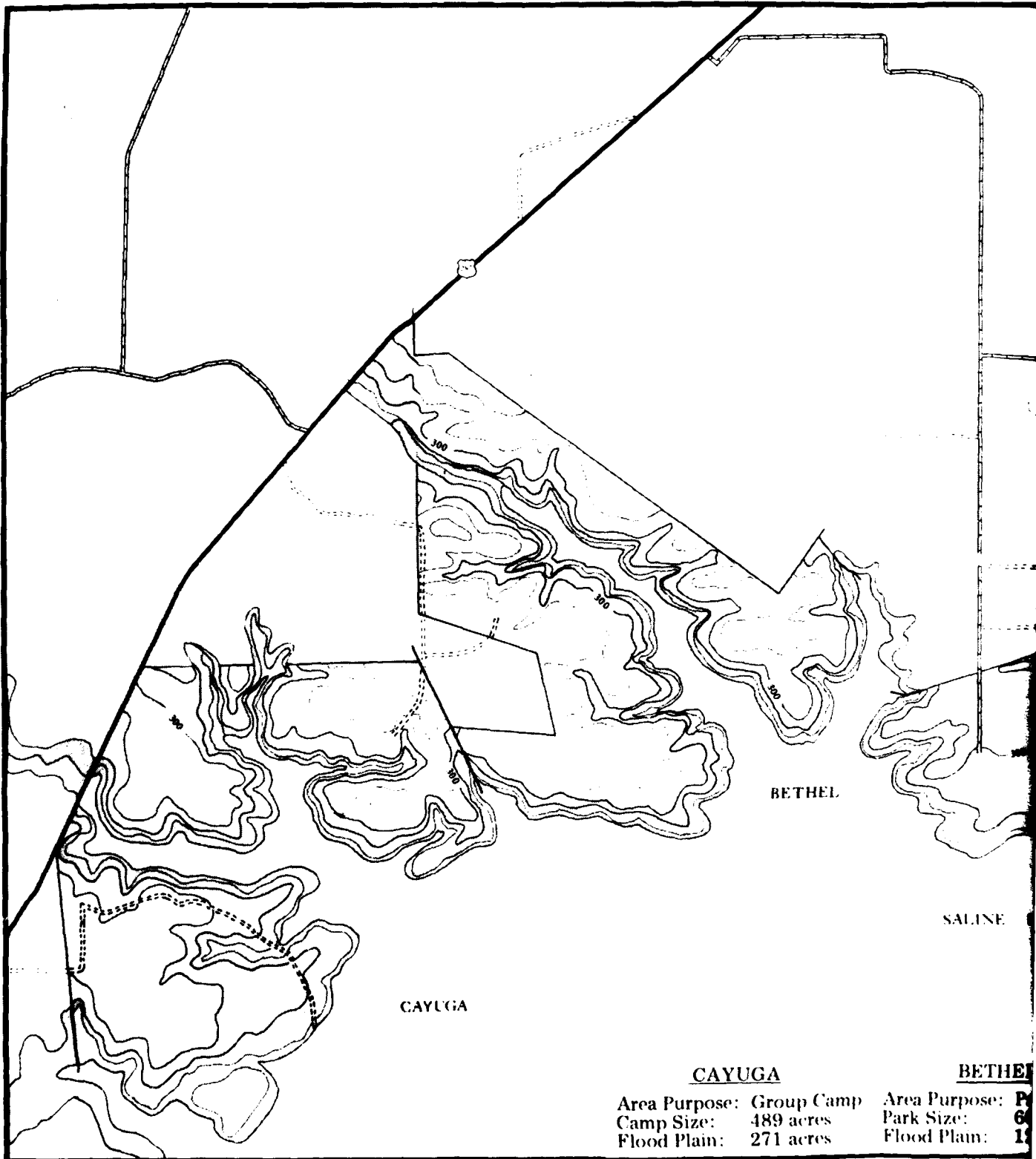




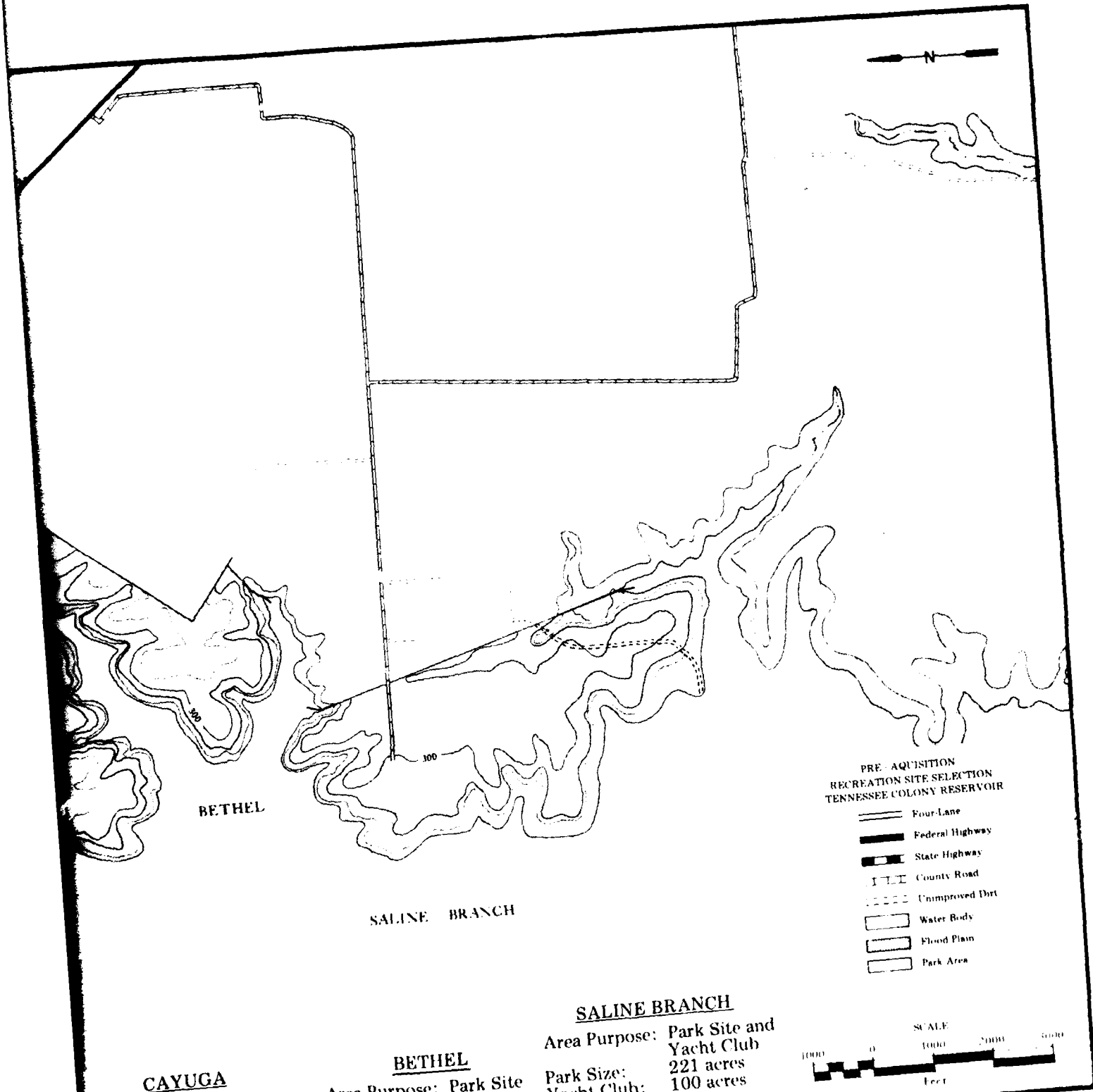








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<u>CAYUGA</u>		<u>BETHEL</u>		<u>SALINE BRANCH</u>	
Area Purpose:	Group Camp	Area Purpose:	Park Site	Area Purpose:	Park Site and Yacht Club
Camp Size:	489 acres	Park Size:	606 acres	Park Size:	221 acres
Flood Plain:	271 acres	Flood Plain:	128 acres	Yacht Club:	100 acres
				Flood Plain:	143 acres

XIII. Benefits

Information in this section to be determined by appropriate Corps staff sections.

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